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SOURCE: (Prepared by): Ocean Data Systems, Inc. - Rockville, MD

TITLE: Acoustic Model Support Activities

REPORT NO.: Proposal No. P-2220

CONTRACT/GRANT NO.: Please provide N00014-73-C-0131

DATE OF REPORT: 30 May 74

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FOR TYPED NAME K. E. EVANS, CDR, USN

OFFICE

Surveillance Environmental Acoustic
Support Project



OCEAN DATA SYSTEMS, INC.

6000 EXECUTIVE BLVD., ROCKVILLE, MARYLAND 20852 • 301/881-3031

LEVEL

II

①

Prepared For:

OFFICE OF NAVAL RESEARCH
ARLINGTON, VIRGINIA

⑥ ACOUSTIC MODEL
SUPPORT ACTIVITIES,
P-2220. ✓

⑪ 34 May 30, 1974

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OCEAN DATA SYSTEMS, INC.

6000 EXECUTIVE BLVD., ROCKVILLE, MARYLAND 20852 • 301/881-3031

May 30, 1974

LCDR V. H. Davis, USN
Technical Director for Acoustic Prediction
Long Range Acoustic Propagation Project
Office of Naval Research
Code 102-OS
Department of the Navy
Arlington, Virginia 22217

Dear LCDR Davis:

Ocean Data Systems, Inc. (ODSI) is pleased to submit this unsolicited proposal No. P-2220 to the Office of Naval Research to perform a series of tasks, the objective of which is the synthesis, transfer, upgrade and/or application of a variety of acoustic models under the direction of the Technical Director for Acoustic Prediction. Specifically, eight separate and distinct tasks are proposed.

Tasks 1, 2 and 3 deal with work to be performed in support of the Acoustic Environment Support Detachment (AESD). Task 1 calls for the further programmatic development of the Multiple Profile Program (MPP) and its subsequent checkout and evaluation (\$21,659). Task 2 calls for the development of improvements to an existing Ambient Noise Model to be selected by the Technical Director for Acoustic Prediction (\$11,169). Task 3 involves the transfer of the ASEPS Model to the Naval Ship Research and Development Center (NSRDC) where it may be exercised by AESD (\$11,169).

Tasks 4, 5, 6, 7 and 8 deal with work to be performed in conjunction with or in support of the Fleet Numerical Weather Central (FNWC), Third Fleet, Bolt Beranek & Newman, Inc. (BBN), the Mediterranean ASW Augmentation Program, and other organizations at the direction of the Technical Director for Acoustic Prediction. Task 4 calls for the maintenance of the ASEPS Model, in particular the version in use at FNWC (\$9,903). Task 5 calls for the adaptation and transfer of the SHARPS and ASRAP models for use on the Third Fleet computer at Pearl Harbor (\$9,628). Task 6 deals with the programmatic implementation of SHARPS II, as specified by BBN (\$10,485). Task 7 deals with the provision of on-site programming support for the Mediterranean ASW Augmentation Program (\$18,927). Finally, Task 8 is concerned with the provision of General Technical Support to LRAPP on a quick-reaction basis (\$6,541).

We propose to perform the above tasks under the same terms and conditions as those defined in Contract No. N00014-73-C-0131.

LCDR V. H. Davis, USN
May 30, 1974
Page 2

This offer may be considered valid for a period of 90 days.
We will be happy to discuss any part of this proposal and provide
any additional information you may require.

Sincerely,

OCEAN DATA SYSTEMS, INC.

Edward Morenoff

Edward Morenoff, Sc.D.
Senior Vice President

EM:rm

Enclosures

NOTICE

"This data furnished in Ocean Data Systems, Inc. unsolicited Proposal No. P-2220 to the Long Range Acoustic Propagation Office, Office of Naval Research, to provide Acoustic Model Support Activities, shall not be disclosed outside the Government or be duplicated, used or disclosed in whole or in part for any purpose other than to evaluate this proposal; provided that if a contract is awarded to this offeror as a result of or in connection with the submission of such data, the Government shall have the right to duplicate, use, or disclose this data, to the extent provided in the contract. The restriction does not limit the Government's right to use information contained in such data if it is obtained from another source without restriction."

This restriction applies to the entire proposal submitted herein by Ocean Data Systems, Inc.

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I. INTRODUCTION

✓
Ocean Data Systems, Inc. (ODSI) is pleased to submit this unsolicited proposal No. P-2220 to the Office of Naval Research to perform a series of tasks, the objective of which is the synthesis, transfer, upgrade and/or application of a variety of acoustic models under the direction of the Technical Director for Acoustic Prediction. Specifically, eight tasks are proposed.

Task 1 calls for the further programmatic development of the Multiple Profile Program (MPP) for the Acoustic Environment Support Detachment (AESD), and its subsequent check out and evaluation. Task 2 calls for the upgrading and improvement of an existing Ambient Noise Model to be designated by the Technical Director for Acoustic Prediction. Task 3 involves the transfer of the ASEPS Model to the Naval Ship Research and Development Center (NSRDC) where it may be exercised by AESD. Task 4 deals with the maintenance and upgrading of the Fleet Numerical Prediction Center (FNWC) version of the ASEPS Model. Task 5 calls for the adaptation and transfer of the SHARPS and ASRAP models for use on the Third Fleet computer at Pearl Harbor. Task 6 deals with the implementation of the SHARPS II model as specified by Bolt Beranek & Newman, Inc. (BBN). Task 7 deals with the provision of on-site programming support for the Mediterranean ASW Augmentation Program. Finally, Task 8 is concerned with the provision of General Technical Support to LRAPP on a quick-reaction basis.

ODSI is particularly well qualified to provide the proposed support activities having done similar work for LRAPP in the past. Further, we are intimately familiar with the acoustic models associated with the work proposed herein.

Dr. Edward Morenoff, Senior Vice President, has been selected to direct the proposed effort. Dr. Morenoff was project leader of work performed under Contract No. N00014-72-C-0291 which led to substantive improvements to the SHARPS, ASRAP and SUBRAP models, development of the TASSRAP model and the implementation of programs in support of Navy requirements such as those defined for NEAT, ASW Assessment and SURVRAP. Dr. Morenoff is currently project leader for Contract No. N00014-73-C-0131 providing model development and support functions for the Office of Naval Research.

Dr. Morenoff will be aided in the performance of the proposed work by a project team drawing upon the talents and backgrounds of Messrs. Paul Wolff, Robert Colilla, Edward Ver Hoef, Charles Baker, Kenneth Osborne, Howard Straus, Warren Yogi, Gilbert Jacobs, William Earley, Marshall Lasky, Frank Ryan, Ms. Carol Hess and Susan Joudrey, and Mr. Robert Kozel.

Mr. Wolff has had a distinguished career as an environmental scientist which has included pioneering efforts in the field of atmospheric/oceanic systems, the application of numerical methods and computer technology for modeling their

physical characteristics, analyzing their past activity and predicting their future behavior. His twenty-nine years of professional experience have been filled with significant scientific achievements, publication of numerous technical papers and successively more responsible positions in the meteorological and oceanographic communities.

Mr. Colilla was the ODSI Technical Staff Member most directly responsible for the adaptation of the NISSM II model for the CDC 6700 under Contract N00014-73-C-0131, and for the documentation and enhancement of the Long Range Propagation Loss Model (RP70) with respect to improving its overall efficiency of operation under Contract No. N66314-70-C-0778. Mr. Colilla also participated in the ambient noise investigations under Contract No. N66314-71-C-2817. He was the lead technical staff member under Contract No. N00014-72-C-2091 involved with revisions and improvements of the ASRAP model to introduce quarter cycle ray tracing without using the companion ray and to calculate all crossings of receiver levels from the crossings in the first quarter cycle and its adaptation to the CP642 computer system. Under Contract No. N00014-73-C-0131, he is principally responsible for ODSI efforts related to the Acoustic Environmental Support Detachment (AESD), particularly with respect to the transfer of models to the AESD computer facility, the implementation of the Multiple Profile Transmission Loss Model and the SASS and Noise Model developments. He has also actively participated in the exercise of these and other models in support of specific Navy requirements.

Mr. Ver Hoef was the technical task leader responsible for the innovations which led to the reduction of the SHARPS II Range Prediction Model per point computation rate from 30 seconds to little over 5 seconds under Contract No. N00014-72-C-0147. Under Contract No. N00014-72-C-2091, he was principally responsible for the development and integration of the TASSRAP model. Under Contract No. N00014-73-C-0131, Mr. Ver Hoef has been engaged in the generalization of the TASSRAP model to operate on a world-wide basis in addition to just the Mediterranean Sea. Mr. Ver Hoef also brings to the project an extensive knowledge of the CDC 6000 series computer system operating environment and its inter-relationship to operational acoustic models to be executed therein. This knowledge was gained, in part, through the development of techniques for the measurement of vital FNWC operating system utilization statistics under Contract No. N66314-70-C-4146 and in the development of a system resource allocation and measurement and report system for FNWC under Contract No. N66314-71-C-1653. Mr. Ver Hoef also has extensive knowledge of the NOVA-800 computer and the XDOS operating system used on the ARPS configuration including this computer. Under Contract No. N00014-73-C-0499, he participated in the design and implementation of the analysis programs for the NOVA computer used in the TEX exercise in the Ionian basin and was a member of the team assembled at Naples, Italy for the post-exercise analysis.

Mr. Baker's experience with acoustic models includes the adaptation of the SHARPS model for the CP642 computer system under Contract No. N00014-72-C-2091. Under Contract No. N00014-73-C-0131, he modified the TASSRAP system to replace ASRAP by FACT and adapted the FACT transmission loss model for operation on the CDC 6700 and 6500 computers for execution at both NSRDC and FNWC, respectively. He also participated in the installation of TASDA on the U.S.S. Kitty Hawk.

Mr. Kenneth Osborne's background with underwater acoustic models includes his contractor position as task manager for Project Caesar at the FNWC which involved the design, development and implementation of a simulator for marine acoustic signal processing on the CDC 6500 computer system. Under Contract No. N00014-73-C-0131, he has played a lead role in the data reduction function associated with the evaluation of the TASSRAP model and in its generalization for operation on a world-wide basis. Mr. Osborne has also participated in the SURVRAP project in a development capacity and in the ASRAP effort under Contract No. N00014-72-C-2091. The incorporation of the geometrical concepts he developed in his work on the TASSRAP model within the framework of the SURVRAP Project resulted in the initial development of the ASEPS model.

Mr. Howard Straus has extensive experience in the design of underwater acoustic models. He was a participant in the

development of the FNWC Propagation Loss Model under Contract No. N66314-70-C-0778 and in the ambient noise computation investigations under Contract No. N66314-71-C-2817. Further, Mr. Straus was responsible for the sensitivity investigation of the operational Ambient Noise Model with respect to variation of selected loss values and specified distances under Contract No. N00014-72-C-0147. Finally, under Contracts No. N00014-72-C-0291 and No. N00014-73-C-0131, Mr. Straus has provided technical support for a variety of oceanographic exercises to the Office of Naval Research, including being a member of the TEX post-exercise analysis team.

Mr. Warren Yogi has been involved in providing operational support to the Office of Naval Research and FNWC acoustic environmental modeling projects. He has been instrumental in the implementation, testing and application of specific exercises of the RP-70, ASRAP and ambient noise models. Under Contract Nos. N00014-72-C-2091 and N00014-73-C-0131, Mr. Yogi was actively engaged in the development and operation of acoustic models and their associated programs to satisfy Anti-Submarine Warfare requirements.

Mr. Gilbert Jacobs has worked on the Multiple Profile transmission loss model and the NISSM active model. In particular, under Contract No. N00014-73-C-0131, he has adapted the Multiple Profile model to accept an arbitrarily large number of sound speed profiles and using those profiles, has built a sound speed field for use in ray tracing.

Mr. William Earley's experience with acoustic models includes his efforts under Contract No. N00014-73-C-0131 in which he developed programs to produce a series of plots of vertical and horizontal ambient noise at specified receiver depths along with transmission loss and arrival structure for various source depths at each receiver depth. In addition, he has worked on portions of the Multiple Profile transmission loss model and TASSRAP, and supported the NISSM II and SASS efforts under the same contract.

Ms. Hess and Messrs. Ryan and Kozel have performed support tasks in conjunction with ASEPS-related activities for LRAPP. Finally, Ms. Joudrey and Mr. Lasky have performed similar support tasks in conjunction with Noise Model-related activities for LRAPP. All such support has been performed under Contract No. N00014-73-C-0131.

Section II, Technical Approach, describes how ODSI intends to realize the goals of the proposed effort. Section III, Project Management, presents proposed manpower, performance and cost schedules for the contractual effort. Sections IV and V discuss Relevant Corporate Experience and Corporate Capabilities, respectively. Finally, Section VI, Personnel Resumes, elaborates on the background and experience of project personnel.

II. TECHNICAL APPROACH

Each of the eight task efforts defined herein are separate and distinct. The Contracting Officer or his duly appointed Technical Representative may elect any or all of these tasks to be performed by ODSI.

Task 1: MPP Development

Model 1 of the Multiple Profile Transmission Loss Model (MPP) is ready for exhaustive testing. The testing will evaluate the adequacy of the physics incorporated in the model and determine the model's sensitivity to changes in various sub-algorithms and parameter sets. Comparison of the results will be made with those of other models, in particular, with those of the Parabolic Equation Model.

In anticipation of this evaluation phase of the Multiple Profile Model, Ocean Data Systems, Inc. proposes a number of alterations to the model to facilitate rapid testing by reducing the turn-around time needed for an execution of the model and by reducing the amount of manual preparation required by the AESD staff.

In its present form, the Multiple Profile Model is divided into ten overlays each of which, except the first, gets its input from temporary files written by some previous overlay and by data saved in common storage. The first overlay reads parameters needed by all overlays from cards. The structure requires that all overlays be executed whenever it is desired to determine the effects of changing one parameter used by only one overlay.

ODSI proposes to restructure the model into five sub-programs, some of which may have to be overlayed in order to keep memory requirements within 100,000 words. Each sub-program will receive its input exclusively from files previously catalogued by other sub-programs and from cards. A sub-program will only read cards for parameters that it needs. Each sub-program will be capable of being executed by itself as many times as desired without the involvement of other sub-programs provided the sub-program's input exists in a catalogued file. As proposed, the AESD staff members will be able to experiment with the parameters and algorithms of any individual sub-program without involving other sub-programs, unless desired, thereby reducing turn-around time and manual preparation.

Task 2: Noise Model Development

One of the operational LRAPP ambient noise models is capable of determining ambient noise for an ocean point with flat bottom of varying roughness and with a single sound speed profile. As the first step in the development of an improved operational noise model, ODSI proposes to design the modifications needed to allow the model to operate at a variable depth point and with changing profile down range. The deliverable item will be a report delineating the design changes.

Task 3: ASEPS Transfer

The ASEPS model developed by LRAPP is currently operational in the Control Data 6500 at Monterey, California, Fleet Numerical Weather Central. There is a requirement to transfer this model

to the CDC 6700 at NSRDC in Maryland.

Transferring the model involves adapting it to operate on the hardware configuration present at NSRDC. In particular, it means replacing the portions that use extended core memory with a suitable alternative. Also involved is breaking up the model so that it can run in central memory segments of 100,000 words or less. ODSI proposes to effect the transference of ASEPS in accordance with the above. No improvements, however, will be made as part of the proposed task to further optimize the execution of the model on the CDC 6700.

Task 4: ASEPS Upgrade

ODSI proposes to analyze problems arising from the use of ASEPS at FNWC. As part of its analysis, ODSI will determine if the model is being properly used and if any problems encountered are attributable to the model itself. If, however, such is the case, ODSI will determine what modifications are required and then implement them at FNWC.

Task 5: SHARPS/ASRAP Transfer

The ASRAP and SHARPS models are currently operational on a number of computers, including the CDC 6500 at FNWC. The FNWC version is the most current and complete version. There is a requirement to transfer each of these models, both SHARPS and ASRAP, to the computer system employed by the Third Fleet at Pearl Harbor. ODSI proposes to effect this transfer by adapting the operational versions of the models currently in use at FNWC for use on the Third Fleet computers.

Task 6: SHARPS II Development

The active model SHARPS is about to be upgraded based on physical specifications supplied by Bolt Beranek and Newman, Inc. (BBN). ODSI proposes to carefully examine the physical specifications produced by BBN and prepare the corresponding program specifications for a new version of the SHARPS model.

Task 7: Mediterranean ASW Augmentation

The Mediterranean ASW Augmentation program is a concerted effort to improve the ASW capability in the Mediterranean Sea. One of the facets of this program is the assemblage of a team of multi-discipline experts in Naples, Italy during the first six months of FY 75. This team will examine all aspects of the ASW effort and provide all possible support to this effort, including such activities as post-operation analysis, pre-operation planning assistance, performance prediction, etc. It is expected that the team will have available a NOVA 900 computer in the ARPS configuration.

The ODSI personnel proposed for this project are familiar with this system and the associated system software. In addition, they are familiar with many of the various performance prediction models, both those that operate at Fleet Numerical Weather Central and those implemented on the NOVA. They have also had experience in operations analysis. It is expected that situations will occur from time to time where the regular

team assembled in Naples will be able to benefit from the assistance of one or both of these ODSI personnel. Therefore, ODSI proposes to place these people on an on-call basis from July 14, 1974, to December 15, 1974, to provide a quick response to these needs. It is anticipated that during this period each of these people will make three trips to Naples and that the cumulative effort invested will be one man-month on the part of each person.

Task 8: General Technical Support

ODSI proposes to provide General Technical Support to the Technical Director for Acoustic Prediction. Such support will include analysis, programming and/or consulting activities as requested with respect to LRAPP-related models and their application to a variety of Navy exercises and scenarios. The support will be provided on a quick-reaction basis.

III. PROJECT MANAGEMENT

The proposed ODSI project team, under the direction of Dr. Edward Morenoff, is identified in Figure III-1.

Figure III-2 is an exhibit of the projected allocation of professional and technical manpower during the contractual effort. This effort is shown as task man-months for the duration of the project. Figure III-3 is an exhibit of the major project milestones. Completion dates for each task are based on dates indicated in the figure.

The cost schedule is shown in Figure III-4. Each task is separately priced on the same basis as the task efforts being performed under Contract No. N00014-73-C-0131. Dr. Morenoff and Mr. Wolff are shown as Corporate Staff Scientists. Messrs. Colilla, Ver Hoef and Baker are shown as Senior Technical Directors. Messrs. Osborne, Straus and Yogi are shown as Technical Associates I. Messrs. Jacobs, Earley and Lasky are shown as Technical Associates II. Mr. Ryan is shown as Technical Staff I. Ms. Hess and Joudrey and Mr. Kozel are shown as Technical Staff II.

The cost schedule is based on the assumption that computer time as required for the performance of each of the tasks will be made available to ODSI as Government Furnished Equipment.

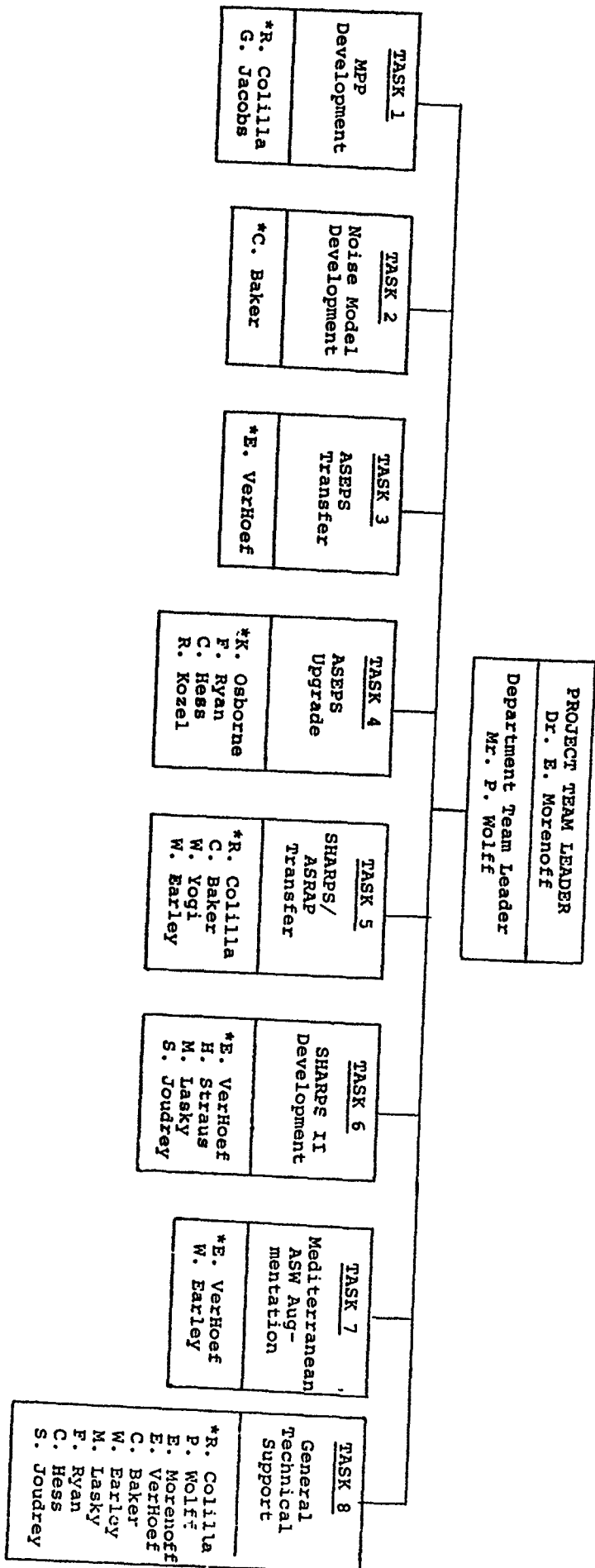


FIGURE III-1: ODSI PROJECT TEAM

TASK/MONTH	1	2	3	4	5	6	7	8	9	10	11	12	Total
1 MPP Development	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6			5.5
2 Noise Model Development	0.3	0.3	0.3	0.3	0.3	0.3	0.3						2.1
3 ASEPS Transfer	0.3	0.3	0.3	0.3	0.3	0.3	0.3						2.1
4 ASEPS Upgrade	0.5	0.5	0.5	0.5	0.5	0.5							3.0
5 SHARPS/ASRAP Trsfr.	0.4	0.4	0.4	0.5	0.5								2.2
6 SHARPS II Development	0.5	0.5	0.5	0.5	0.5	0.5							3.0
7 Med. ASW Augmentation	0.3	0.3	0.3	0.3	0.4	0.4							2.0
8 General Tech. Support	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	1.8
TOTALS	2.9	2.9	2.9	3.0	3.1	2.7	1.4	0.8	0.8	0.8	0.2	0.2	21.7

FIGURE III-2: MANPOWER ALLOCATION BY TASK
(In Man-Months)

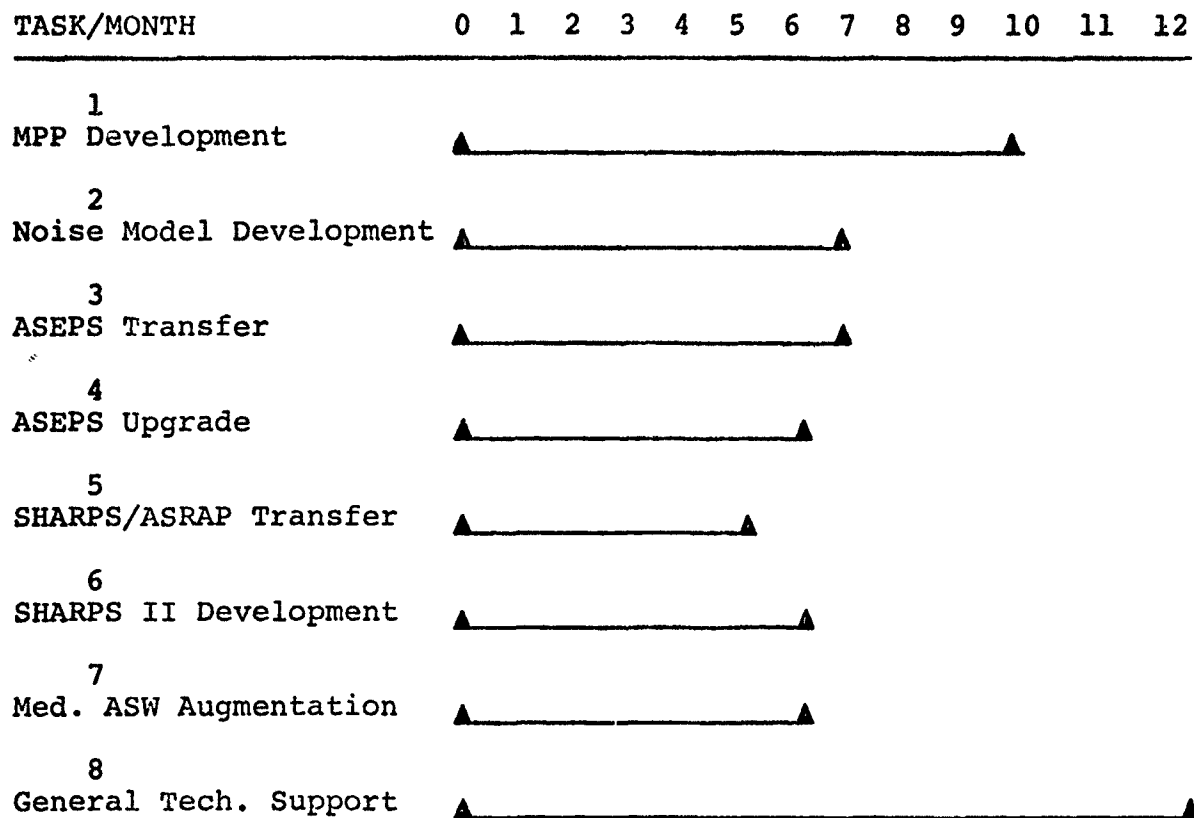


FIGURE III-3: PROJECT MILESTONES

FIGURE III-4: COST SCHEDULE

TASK 1: MPP Development

A. Personnel:

Senior Technical Director	0.5 mm @ \$5207/mm	\$2,604
Technical Associate II	5.0 mm @ \$3739/mm	<u>18,695</u>

SUBTOTAL \$21,299

B. Travel:

Local Travel - ODSI to/from NSRDC		
(50 trips) x (18 miles/trip) x (\$0.15/mile)	\$	135
Local Travel - ODSI to/from AESD		
(25 trips) x (60 miles/trip) x (\$0.15/mile)	<u>\$</u>	<u>225</u>

SUBTOTAL \$ 360

TOTAL TASK 1 \$21,659

TASK 2: Noise Model Development

A. Personnel:

Senior Technical Director	2.1mm @ \$5207/mm	\$10,935
---------------------------------	-------------------	----------

SUBTOTAL \$10,935

B. Travel:

Local Travel - ODSI to/from NSRDC		
(20 trips) x (18 miles/trip) x (\$0.15/mile)	\$	54
Local Travel - ODSI to/from AESDA		
(20 trips) x (60 miles/trip) x (\$0.15/mile)	<u>\$</u>	<u>180</u>

SUBTOTAL \$ 234

TOTAL TASK 2 \$11,169

TASK 3: ASEPS Transfer

A. Personnel:

Senior Technical Director 2.1mm @ \$5207/mm \$10,935

SUBTOTAL \$10,935

B. Travel:

Local Travel - ODSI to/from NSRDC
(20 trips) x (18 miles/trip) x (\$0.15/mile) \$ 54

Local Travel - ODSI to/from AESD
(20 trips) x (60 miles/trip) x (\$0.15/mile) 180

SUBTOTAL \$ 234

TOTAL TASK 3 \$11,169

TASK 4: ASEPS Upgrade

A. Personnel:

Technical Associate I 1.0mm @ \$4271/mm \$ 4,271

Technical Staff I 1.0mm @ \$2931/mm \$ 2,931

Technical Staff II 1.0mm @ \$1979/mm \$ 1,979

SUBTOTAL \$ 9,181

B. Travel:

Monterey/San Diego
3 R/T Coash @ \$74/trip \$ 222

10 days per diem @ \$30/day \$ 300

10 day car rental @ \$20/day \$ 200

SUBTOTAL \$ 722

TOTAL TASK 4 \$ 9,903

TASK 5: SHARPS/ASRAP Transfer

A. Personnel:

Senior Technical Director	0.7mm @ \$5207/mm	\$ 3,645
Technical Associate I	0.5mm @ \$4271/mm	\$ 2,136
Technical Associate II	1.0mm @ \$3739/mm	<u>\$ 3,739</u>

SUBTOTAL \$ 9,520

B. Travel:

Local Travel - ODSI to/from NSRDC
(40 trips) x (18 miles/trip) x (\$0.15/mile) \$ 108

SUBTOTAL \$ 108

TOTAL TASK 5 \$ 9,628

TASK 6: SHARPS II Development

A. Personnel:

Senior Technical Director	0.5mm @ \$5207/mm	\$ 2,604
Technical Associate I	0.5mm @ \$4271/mm	\$ 2,136
Technical Associate II	1.0mm @ \$3739/mm	\$ 3,739
Technical Staff II	1.0mm @ \$1979/mm	<u>\$ 1,979</u>

SUBTOTAL \$10,458

B. Travel:

Local Travel - ODSI to/from NSRDC
(10 trips) x (18 miles/trip) x (\$0.15/mile) \$ 27

SUBTOTAL \$ 27

TOTAL TASK 6 \$10,485

TASK 7: Mediterranean ASW Augmentation

A. Personnel:

Senior Technical Director	1mm @ \$5207/mm	\$ 5,207
Technical Associate I	1mm @ \$4271/mm	\$ 4,271
SUBTOTAL		\$ 9,478

B. Travel:

Washington, D. C./Naples, Italy		
3 R/T @ \$915/trip		\$ 2,745
Monterey, California/Naples, Italy		
3 R/T @ \$1,468/trip		\$ 4,404
46 days per diem @ \$30/day		\$ 1,380
46 days car rental @ \$20/day		\$ 920
SUBTOTAL		\$ 9,449
TOTAL TASK 7		\$18,927

TASK 8: General Technical Support

A. Personnel:

Corporate Staff Scientists	0.2mm @ \$6162/mm	\$ 1,232
Senior Technical Director	0.3mm @ \$5207/mm	\$ 1,562
Technical Associate II	0.4mm @ \$3739/mm	\$ 1,495
Technical Staff I	0.4mm @ \$2931/mm	\$ 1,172
Technical Staff II	0.5mm @ \$1979/mm	\$ 990
SUBTOTAL		\$ 6,451

B. Travel:

Local Travel - ODSI to/from LRAPP		
(10 trips) x (60 miles/trip) x (\$0.15/mile)		\$ 90
SUBTOTAL		\$ 90
TOTAL TASK 8		\$ 6,541

NOTE 1: Each Man-Month is comprised of 173.33 man-hours.

NOTE 2: The hourly rates for each labor category shown are as follows:

Corporate Staff Scientist	\$35.55/hour
Senior Technical Director	\$30.04/hour
Technical Associate I	\$24.64/hour
Technical Associate II	\$21.57/hour
Technical Staff I	\$16.91/hour
Technical Staff II	\$11.42/hour

IV. RELEVANT CORPORATE EXPERIENCE

As a corporation, ODSI has established a solid record of achievement in the successful completion of projects which have been undertaken. Many of these projects are relevant to the subject procurement, as a consequence of the nature of the work involved. In this Section examples are cited, together with a brief description of the work performed and points of contact within the client's organization who can provide information to permit evaluation of the quality of the work performed.

U. S. Navy Office of Naval Research
(Contact: LCDR T. McCloskey, U. S. N., Manager
LRAPP Acoustic Prediction Program, Telephone
No. 301/767-2843).

Under Contract N00014-72-C-0147, ODSI re-structured and partially recoded the SHARPS II Range Prediction Model to facilitate its operational utilization. The effort resulted in an 83% reduction in the elapsed time on a per location basis from approximately 30 seconds to 5.1 seconds. A Counter Detection (CD) prediction capability identifying the maximum range at which a target could hear the searching of designated Sonars was devised for the model. Finally, the sensitivity of the operational Automated Ambient Noise Model was investigated with respect to variations of selected loss values and specified distances.

U. S. Navy Office of Naval Research
(Contact: LCDR T. McCloskey, U. S. N., Manager
LRAPP Acoustic Prediction Program, Telephone
No. 301/767-2843).

Under Contract N00014-72-C-0291, ODSI has performed a number of tasks. These have included, but are not limited, to the following: modifications to the ASRAP model to include the quarter ray trace and quarter ray recursion capability, the use of critical angles for starting rays and for special bottom rays,

and the variation of range increments as a function of distance from the source; the development of TASSRAP, a model to provide range prediction for the ITASS towed array, including modifications to ASRAP and the FNWC automated ambient noise model; the adaptation of ASRAP to the UNIVAC 642 computer system; the provision of plot programs for the NISSM reverberation and propagation loss models and the BELL transmission loss ambient noise models in connection with an ASW assessment requirement; and the model modifications and operation in connection with the SURVRAP requirements.

U. S. Navy Office of Naval Research

(Contact: LCDR T. McCloskey U. S. N., Manager LRAPP Acoustic Prediction Program, Telephone No. 301/767-2843).

Under Contract N00014-73-C-0131, ODSI performed a number of tasks. These have included but are not limited to the: aided in the establishment of computational and remote terminal requirements for the Acoustic Environmental Support Detachment; adapted and upgraded the FACT Transmission Loss, Noise and Arrival Models to operate on the CDC 6000 series computers, developed a worldwide version of the TASSRAP Model; continued support work on SURVRAP and AWS assessment; and installation of ICAPS/TASDA on the U. S. S. Kitty Hawk.

U. S. Navy Fleet Numerical Weather Central

(Contact: Captain Conley R. Ward, U. S. N. Commanding Officer, Telephone No. 408/646-2141).

Under Contract N66314-70-C-5156, ODSI performed three distinct tasks. The first task dealt with improving the accuracy of an anti-submarine warfare forecast model and involved the modification of existing computer programs and the design and implementation of new programs. All programs were developed in FORTRAN for operation on the CDC 6500 under the SCOPE operating system. New programs implemented included special plot programs to produce computer drawn plots of expendable bathythermograph data on a Varian Plotter connected to the CDC 6500. Task Two dealt with SCOPE level investigations and modifications. First, analytic programs were developed for use in obtaining information concerning the usage of certain CDC 6500

system components (namely, peripheral processors, extended core storage and central memory) and the interactions associated with their concurrent usage. Second, the CDC 6500 disk input/output facility was modified with the goal of making it more efficient, capable of further upgrading with reasonable ease, and to pave the way for ultimate development of a full-tract driver. This effort included splitting the Stack Processor into 2 programs capable of operation in separate peripheral processors. Task Three was concerned with incorporating a restart capability in the FNWC Atmospheric Primitive Equation Prediction Model which limited the real time loss in the event of any type failure to an operationally acceptable upper bound of 10 minutes and rewriting selected frequently used subroutines in very efficient COMPASS level code to take full advantage of the CDC 6500 hardware environment.

U. S. Navy Fleet Numerical Weather Central

(Contact: Captain Conley R. Ward, U. S. N. Commanding Officer, Telephone No. 408/646-2141). Under Contract N66314-70-C-0778, ODSI developed and implemented techniques leading to the improvement of the operating efficiency and performance characteristics of the existing FNWC Acoustic Propagation Loss Model. As part of this effort, a new mechanism was formulated for computing the sine of an angle, which when implemented in COMPASS, was significantly faster than the standard CDC library square root routine. Also, programs were developed to generalize the Model's output chart generation mechanisms with respect to plotting, scaling and grid line construction.

U. S. Navy Fleet Numerical Weather Central

(Contact: Captain Conley R. Ward, U. S. N. Commanding Officer, Telephone No. 408/646-2141). Under Contract N66314-71-C-1653, Task 2, ODSI participated in the design and implementation of procedures for monitoring and controlling the use and allocation of computer resources by the FNWC CDC66500 computer users. In particular, ODSI supplied the programs which generate the authorized allocation rate table, analyze SCOPE generated Dayfile records to determine resource usage, compare actual to authorized resource usage, and present the results in tabular and histogram form. Programs were written in FORTRAN and COMPASS. Under Task 1 of the same contract, ODSI repartitioned an existing four processor version of the FNWC atmospheric prediction model on the basis of

horizontal domain, rather than computational burden considerations. The repartitioning of the model resulted in a reduction of elapsed execution time for a seventy-two hour prediction run from two hours to approximately seventy-two minutes.

U. S. Navy Fleet Numerical Weather Central

(Contact: Captain Conley R. Ward, U. S. N. Commanding Officer, Telephone No. 408/646-2141). Under Contract N66314-72-C-1372, ODSI developed a two processor version of the Navy Atmospheric Primitive Equation Model, partitioned on the basis of horizontal domain equations. The two processor version of the Model is employed principally to provide operational back-up for the operational four processor version of the Model at FNWC and as a research and development tool.

V. CORPORATE CAPABILITIES

The corporate history of Ocean Data Systems, Inc. (ODSI) dates back to January 1969 when the firm was formed for the initial purpose of responding to the rapidly expanding requirement for data systems within the marine and ocean sciences community. Over the years, this requirement has been well served by ODSI -- and this area of specialty remains as one, among several, of the firm's major lines of business today.

As a result of the firm's outstanding record of performance, the scope of ODSI's management and information sciences has been significantly extended for application to problems of national concern such as the energy crisis, the deterioration of our environment, law enforcement and improved transportation systems among others. ODSI has now evolved into one of the most unique computer-related technology service companies in the nation. The firm's expertise in computer sciences now embraces the fields of oceanography, meteorology, space technology, defense systems, business management, and law enforcement. In each of these fields, ODSI provides services for technical studies, systems analysis, systems design, computer programming and data processing along with related support services. Dependent upon individual customer needs, selected types of services are provided under separate short-term contracts. Alternatively, the full spectrum of these services are provided by ODSI to some customers under long-term computer facility management contracts.

The President of ODSI is Dr. Jerome Morenoff. Dr. Morenoff has a distinguished record of achievement in both computer science and international legal affairs. He has served in the executive Office of the President as a computer specialist and his experience includes executive positions with several data processing companies. Dr. Morenoff is responsible for establishing corporate policy and directing all corporate operations.

The Executive Vice President is Donald L. Roth, Esquire. Mr. Roth served as Trial Attorney for the Securities and Exchange Commission and thereafter was engaged in a prominent practice in financial and corporate law. At ODSI, Mr. Roth is responsible for financial, administrative and legal affairs and those of its subsidiaries. In addition, he directs the Company's programs of growth by both internally funded expansion into new business areas and the merger or acquisition of other firms.

Dr. Edward Morenoff is Senior Vice President. He is recognized as an expert in the field of information and data base file management systems, computer program transferability and standardization, and modular programming. Dr. Morenoff has primary management responsibility for the technical operations of the company and insuring that the needs and requirements of ODSI's government and industrial clients are fully and completely satisfied.

ODSI's dynamic growth has attracted a highly qualified and technically oriented group of scientists, engineers, computer specialists and skilled artisans whose combined expertise covers all phases of systems analysis and development, from basic research through systems implementation, and on-going operational support. Total employment of the firm is currently in excess of 110 personnel, of which approximately 80% are professional personnel.

ODSI is headquartered in suburban Washington, D. C., at Rockville, Maryland. In addition to the operations performed at this location, services are also available from the Company at its branch offices located at Albany, New York; Wilmington, North Carolina; and Monterey, California. The firm is also engaged in the supply of its services on-site at various Government installations across the nation.

At its current size, ODSI is classified as a small business firm. Total sales for its Fiscal Year 1973 were approximately \$2 million and a total sales of over \$3 million are projected for ODSI's Fiscal Year 1974. ODSI has been profitable since its first year of operation, and its financial condition is excellent.

The Company's books were audited from inception through fiscal 1973 by Coopers and Lybrand. The Company's current auditors are Laventhol Krekstein Horwath & Horwath. ODSI's accounting records have also frequently been examined by the

Federal Government both in connection with pre-award surveys and the approval of invoices for payment. No difficulties have ever been experienced in connection with such examinations.

On the basis of the technical and management strengths of ODSI's founding principals, substantial equity financing has been obtained through the agency of a leading investment banking firm. Among the prominent institutional investors owning substantial amounts of ODSI common stock are Bankers Trust Company of New York and State Farm Mutual Automobile Insurance Company. As of June 30, 1973, ODSI's stockholder equity was in excess of \$750,000. Further, an unsecured line of credit in the amount of \$250,000 has been extended to ODSI by First National Bank of Maryland. However, due to ODSI's ample cash resources and satisfactory performance and collection experience, borrowing has not been necessary to any great extent to finance performance.

VI. PERSONNEL RESUMES

EDWARD MORENOFF
PAUL M. WOLFF
ROBERT A COLILLA
EDWARD W. VER HOEF
CHARLES L. BAKER
KENNETH R. OSBORNE
HOWARD D. STRAUS
WARREN S. YOGI
GILBERT V. JACOBS
WILLIAM D. EARLEY
MARSHALL LASKY
FRANK J. RYAN
CAROL A. HESS
SUSAN M. JOUDREY
ROBERT KOZEL

EDWARD MORENOFF
Senior Vice President

EDUCATION

Doctor of Computer Science (Sc.D.) The George Washington University	1969
Master of Science, Electrical Engineering Columbia University	1958
Bachelor of Science, Electrical Engineering Columbia University	1957
Bachelor of Arts, Mathematics Columbia College	1956

PATENTS

Method and Apparatus for Storage and Selective
Retrieval of Magnetic Recorded Data, U. S. Patent
No. 3,229,877, January 1966

Method and System for Program Linkage and Communica-
tion Mechanism for Computers. U. S. Patent No.
3,564,504, February 1971

PROFESSIONAL EXPERIENCE

Dr. Morenoff is nationally recognized in computer science and technology. His 15 years of professional experience in the design and implementation of computer systems have provided him with a comprehensive understanding of computer hardware and software applications. He has published numerous papers concerning file management systems and computer program transferability.

Ocean Data Systems, Inc., Rockville, Maryland, 1969 - Present

Dr. Morenoff is Vice President for Computer Systems. He has primary management responsibility for the application of computer hardware and software systems to meet the needs of the scientific community. One major project is the development of a proprietary family of general purpose file management systems, distinguished by their high degree of insensitivity to changes to computer hardware configurations, data format and structure, and computer programs.

Dr. Morenoff developed for the Fleet Numerical Weather Central a partition synchronization mechanization employed in the four-part partition of the Kesel-Winninghoff Primitive Equation Atmospheric Prediction Mode. The mechanism allows the model to operate in a four processor mode to take advantage of the equation set's mathematical parallelism

and the FNWC's two dual processor CDC 6500 computer systems. He has also analyzed the operations of the FNWC computer facility, developed a set of recommendations as to how overall system performance and efficiency could be improved, and contributed to improving the performance characteristics of the FNWC Underwater Sound Propagation Loss Model.

Dr. Morenoff performed a preliminary study for the National Oceanographic and Atmospheric Agency leading to the integration and inter-connection of the two CDC 6600 Computer Division computers with the computers operated by the National Meteorological Center and the National Environmental Satellite Center. In addition, he was a principal investigator in the analysis of the requirements for automation of the Special Testing and Research Laboratory of the Bureau of Narcotics and Dangerous Drugs and for a Laboratory Spectra Retrieval System in support of the Bureau's chemists. He also performed an analysis of the automation requirements of the back office operations of a brokerage firm and of the computer system performance for a wholesale grocery operation.

Rome Air Development Center, Rome, New York, 1958 - 1969

Dr. Morenoff, while serving on the Technical Staff of the Rome Air Development Center (USAF), was stationed in Washington, D.C. He contributed to the definition and formulation of projects in information processing of potential long range value to the U.S. Air Force. One of the most significant projects was the investigation of techniques by which computer software programs could be transferred from one arbitrary operating environment to another with little, if any, additional cost in time or money. During this period, Dr. Morenoff also provided consulting services to various Department of Defense organizations, including the Office of the Secretary of Defense.

Preceding his assignment in Washington, D.C. Dr. Morenoff served as special assistant to the Chief, Information Processing Laboratory, Rome Air Development Center. In that capacity, he provided technical consulting services to staff engineers related to information data handling. He was also responsible for advanced plans and programs for the Center's computer facility.

A principal feature of the computer system designed by Dr. Morenoff for the facility was its ability to share a common pool of high capability, auxiliary storage devices and peripheral equipments among several computers, thus minimizing overall costs involved in providing multiple

equipment for each computer and improving total system reliability and availability. The pool included such diverse hardware as query/response consoles, optical print readers, and random access mass storage devices.

Dr. Morenoff's experience in developing information systems began in 1958. As an Air Force Lieutenant, he served as a project officer responsible for both the Aerospace Intelligence Data System and the ground data processing subsystem for a space reconnaissance project. In the former position, he was involved in initial work on what later became the IBM Formatted File System. Later, as a civilian employee of the Air Force, he led a team in the design of an information processing capability for a completely-militarized, highly-interactive, limited war intelligence data reduction complex. This was followed by the design of an automated storage and retrieval system for the Air Force Reliability Control Data Bank Project. On the basis of this experience, Dr. Morenoff became committed to the basic principles of generalized data management systems, and the need for them in an expanding computer technology.

Ford Instrument Company, Long Island City, New York,
1957 - 1958

Technical Staff Engineer (Summer 1958)

In this capacity, Dr. Morenoff was a member of a specially organized team charged with the design and fabrication of a model of a special purpose digital computer for use with a missile system being developed for the U.S. Army, within a four-month period. His responsibilities included the development of an accurate digital clock, system power supplies and inter-communications links, and assisting in the logical design of the computer's central processing unit.

Technical Staff Engineer (Summer 1957)

Dr. Morenoff participated in a comparative evaluation of computer techniques applied to an airborne navigational system. He was responsible for the investigation of the application of standard digital techniques towards this end. His investigation consisted of designing such a navigational computer, with special emphasis on the problems of size, speed, accuracy and efficiency. The investigation was completed within the allotted time period and the resulting design was selected by company management as the most efficient approach to the problem under consideration.

PUBLICATIONS

"Integrated Three-Dimensional Atmospheric and Oceanic Model Development" (co-author), Institute of Electrical and Electronic Engineers International Convention and Exposition, Session 11, The Evolution of Large Government Computing Systems, New York, New York, March 1973.

"The Navy's Operational Four Processor Atmospheric Prediction Model" (co-author), ARPA/NASA Symposium Programming for ILLIAC IV, Monterey, California, March 1972

"DEM: Data Base Manager", ACM 10th Annual Technical Symposium, Washington, D.C. Chapter, June 1971

"Four-Way Parallel Processor Partition of an Atmospheric Equation Prediction Model" (co-author), Proceedings of the AFIPS 1971 Spring Joint Computer Conference, AFIPS Press, May 1971

"Marine Information Systems, What We Have, What We Need", Oceanology International, Vol. 6, No. 2, February 1971, pp. 34-36

"Marine Data File Management", Proceedings of the Sixth Annual Conference of the Marine Technology Society, 1970, Marine Technology Society, Vol. 1, June 1970, pp. 189-198

"The Transferability of Computer Programs and the Data on Which They Operate", Proceedings of the AFIPS 1969 Spring Joint Computer Conference, Thompson Book Company, April 1969, pp. 609-610

"Table Driven Augmented Programming Environment: A General Purpose User-Oriented Program for Extending the Capabilities of Computer Operating Systems", Doctoral Dissertatuib, George Washington University, December 1968

"Program String Structures: A Building Block Approach for Implementing Computer Programs", Operations Research Society of America, Space Sciences Section Symposium, December 1968

Program Transferability Study Group Report (co-author), Rome Air Development Center Technical Report 68-341, November 1968

"Program String Structures and Modular Programming" (co-author), Proceedings of First National Symposium on Modular Programming, Information and Systems Press, July 1968

"Program String Structures and Coherent Programming", Coherent Programming Seminar, Massachusetts Institute of Technology, Lincoln Laboratories, March 1968

"An Approach to Standardizing Computer Systems" (co-author), Proceedings 22nd National ACM Conference, Thompson Book Company, August 1967, pp. 527-537

"Applications of Generalized Data Management Systems",
AFIPS Spring Joint Computer Conference Data Management
Panel, April 1967

"Inter-Program Communications, Program String Structures
and Buffer Files" (co-author), Proceedings of AFIPS 1967
Spring Joint Computer Conference, Thompson Book Company,
April 1967, pp. 175-184

"On the Standardization of Computer Systems" (co-author)
Rome Air Development Center Technical Report 67-165, April
1967

"The Application of Level Changing to a Multilevel
Storage Organization" (co-author), Communications of the
ACM, 10, 3, March 1967

"A Code for Non-Numeric Information Processing Appli-
cations in On-Line Systems" (co-author), Communications of
the ACM, 10, 1, January 1967, pp. 19-22

"Design of a Program Linkage and Communication
Mechanism for the GE 635 Computer System" (co-author),
Rome Air Development Center Technical Report 66-726,
January 1967

"Job Linkages and Program Strings" (co-author), Rome
Air Development Center Technical Report 66-142, April 1966

"Level Changing and Multilevel Store", Communications-
based Information Systems Symposium, December 1965

"Classifier: An Automated Computer-Oriented Informa-
tion Classification System", Proceedings of the American
Documentation Institute Annual Conference, Cleaner-Hume
Press, October 1964, pp. 411-420

"IPC: A Code Character Set for Information Processing"
(co-author), Rome Air Development Center Technical Report
64-426, October 1964

"Theory of a Multiple Tape Queuing System and its
Applications to Electronic Systems" (co-author), Rome Air
Development Center Technical Report 62-167, May 1962

AWARDS AND HONORS

William Petit Trowbridge Fellow in Engineering,
Columbia University, 1957-1958

Tau Beta Pi (Engineering Honor Society)

Eta Kappa Nu (Electrical Engineering Honor Society)

PROFESSIONAL AFFILIATIONS

Association for Computing Machinery
Institute for Electrical and Electronic Engineers

Professional Group Membership:

Systems Science and Cybernetics

Electronic Computers;

Computer Group Representative

on IEEE Oceanography

Coordinating Committee

r Society of Naval Architects and Marine Engineer's

Marine Resources Exploration Systems Committee

Marine Technology Society

Chairman, Marine Information Systems Committee

Member, Marine Mineral Resources Committee

National Academy of Engineering

Member, Marine Engineering Information & Data

Exchange Panel of the Marine Board

PAUL M. WOLFF
Vice President

EDUCATION

Doctoral work, Numerical Meteorology U.S. Naval Postgraduate School	1959-1963
Graduate work, Meteorology and Mathematics University of Chicago	1951-1952
Master of Science and Meteorology U.S. Naval Postgraduate School	1949
Graduate work, Meteorology and Mathematics University of Chicago	1942-1943
Bachelor of Arts, Mathematics and Physics Wittenberg University	1942

PROFESSIONAL EXPERIENCE

Mr. Paul Wolff has had a distinguished career as an environmental scientist which has included pioneering efforts in the field of atmospheric/oceanic systems, the application of numerical methods and computer technology for modeling their physical characteristics, analyzing their past activity and predicting their future behavior. His twenty-nine years of professional experience have been filled with significant scientific accomplishments, publication of numerous technical papers and successively more responsible positions in the meteorological and oceanographic communities.

Ocean Data Systems, Inc., Monterey, California, 1972-present

As Vice President, Mr. Wolff participates in the formulation of corporate policy and overall management of technical projects. He has responsibility for corporate activities to satisfy the atmospheric and oceanographic analysis and forecasting requirements of the marine science community. He is the corporate officer headquartered in Monterey, California.

Mr. Wolff is currently a member of the: Joint IOC/WMO Group of Experts on IGOS Technical Systems Design; WMO Commission on Maritime Meteorology Working Group on Marine Meteorological Services System; and the Joint IOC/WMO IRES Working Group on Observational Strategy.

U.S. Navy, 1942 - 1972

As a Captain in the U.S. Navy, Paul Wolff most recently was the Office of Naval Research Liaison Officer at the U.S. Naval Postgraduate School, responsible for the development and application of underwater acoustic models and the interpretation of the results of their execution. Immediately prior to that assignment, he served as Commanding Officer, Fleet Numerical Weather Central from 1968 through 1970 and as Officer in Charge, Fleet Numerical Weather Facility from 1961 through 1968. From 1958 through 1960 he served as Officer in Charge, Navy Numerical Weather Project. In 1957 he served as a member of the Joint Numerical Weather Prediction Unit. Mr. Wolff's career also includes duty tours as Director of Micrometeorology at Sea during 1956 and Meteorologist for Carrier Division One from 1954 through 1956. Both during and immediately following World War II he served as meteorologist aboard nine Naval ships.

Mr. Wolff's most notable contributions include: His investigation, while associated with Project AROWA, of wave behavior in the 500 mb level and block formation, the relations between 500 mb and surface systems, cyclogenesis and the adaptation of the results to practical forecasting, where they are still in use; his development and reduction to practice of underwater sound propagation models incorporating environmental effects; his role in the development of a world-wide computer network for the collection of meteorological and oceanographic data, its subsequent analysis and the timely distribution of numerically generated environmental products; his establishment of an operational oceanographic data center; his organization of the first hemisphere-wide synoptic oceanographic observation effort coordinating U.S. and foreign Naval and commercial vessels as ships of opportunity; and his development of numerical synoptic oceanographic analysis/forecasting models on hemispheric and smaller-scale bases treating the atmosphere and ocean as a coupled system - the first of its kind in the world.

PUBLICATIONS

"Investigation and Prediction of Dispersion of Pollutants in the Sea with Hydrodynamical Numerical Models" (co-author) FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing, Rome, Italy, 1970.

"Environmental Forecasting - Largest Marine Information Systems", Marine Technology Society Journal, Vol. 4, No. 6, Nov.-Dec. 1970, pp. 7-18.

"Problems in the Operational Prediction of the Ocean Environment", A Century of Weather Progress, Lancaster Press, Lancaster, Pennsylvania, 1970, pp.105-120.

"Synoptic Analyses and Prediction of Conditions and Processes in the Surface Layers of the Sea" (co-author) Oceans from Space, Gulf Publishing Company, Houston, Texas, 1969, Chapter 10.

"Oceanographic Data Collection", Bulletin of the American Meteorological Society, Feb. 1968.

"Numerical Analysis of Sea Surface Temperature", International Journal of Oceanography and Terminology, Vol. 1, No. 4, 1968, pp. 277-290.

"Oceanographic Data Collection", Proceedings of the IBM Scientific Computing Symposium on Environmental Science, Thomas J. Watson Research Center, Yorktown Heights, N.Y., 1967.

"Ambient Thermal Noise in the Sea and the Instrumental and Observer Error and Biases of Sea Surface Temperature Measurements" (co-author) Proceedings of the Third U.S.N. Symposium on Military Oceanography, 1966, pp. 223-242.

"Numerical Environmental Prediction in the U.S. Navy", Travelers Research Seminar Series, 1965, Hartford, Conn.

"Solution of Naval Numerical Weather Problems (CDC 1604)", Proceedings of the 1960 Computer Applications Symposium, Armour Research Foundation, Illinois Institute of Technology.

"A Comparison of JNNP Trajectory Forecasts with Transosonde Flights" (co-author) Monthly Weather Review, Feb. 1958.

"The Error in Numerical Forecasts Due to Retrogression of Ultra-Long Waves", Monthly Weather Review, July 1958.

"The Prediction of Maritime Cyclones" (co-author) Journal of Meteorology, Vol. 15, 1958.

"The Prediction of Cyclone Intensity over the North Atlantic" (co-author) U.S. Navy, Bureau of Aeronautics Project AROWA Report, March 1955.

"Quantitative Determinations of Long Waves and Their Time Variations", Journal of Meteorology, December 1955.

"Cyclogenesis Along East Coast of Asia" (co-author) U.S. Navy, Bureau of Aeronautics Project AROWA Report, October 1953.

"Cyclogenesis over Southern European and Mediterranean Waters", U.S. Navy, Bureau of Aeronautics Project AROWA Report, November 1952.

AWARDS AND HONORS

Military Oceanography Award, Oceanographer of the Navy, 1969

Special Commendation, Marine Technology Society, 1968

Solberg Award, American Society of Naval Engineers, 1967

Commendation, Commander-in-Chief, Pacific Fleet, 1966

PROFESSIONAL AFFILIATIONS

American Meteorological Society

American Society of Naval Engineers

Phi Eta Sigma

Sigma Xi

ROBERT A. COLILLA
Director of Software Systems

EDUCATION

Graduate Studies in Mathematics 1956-1961
Columbia, Princeton, and New York
Universities

Bachelor of Arts, Cum Laude (Mathematics) 1955
Washington Square College of Arts and
Science
New York University

PROFESSIONAL EXPERIENCE

Mr. Colilla is a computer software specialist with over 16 years experience in the development of programming systems. He has concentrated on both design and implementation of large scale computer programs for scientific and business applications, including general and special purpose file management systems and time-sharing operating systems.

Ocean Data Systems, Inc., Rockville, Maryland, 1969 - Present

Mr. Colilla is Director of Software Systems. He is primarily responsible for the design and implementation of computerized data bases and associated file management systems. He is also responsible for development of scientific and data processing systems and for applications involving statistics and experimental design.

Mr. Colilla is a principal designer of a sophisticated general purpose data management system distinguished by its high degree of machine independence which is being developed as a proprietary company product.

Mr. Colilla was a participant in the Information Systems Requirements Analysis of Farm Family Insurance Companies Operations, focusing his attention on the assessment of the on-going in-house developmental projects and present and projected automation requirements. Subsequently, Mr. Colilla prepared a revised implementation plan for the Auto Processing System and developed a realistic test and evaluation effort to insure the reliability and accuracy of the resulting system.

He was principally responsible for developing major speed up modifications to the U.S. Navy Fleet Numerical Weather Central's Underwater Sound Propagation Loss Model, completing its documentation and designing sub-model implementations for execution on alternate computer configurations. The principal implementation is written in FORTRAN for operation for the FNWC dual processor CDC 6500 computer systems.

Mr. Colilla was a principal designer of the computer system and data base being implemented for the Bureau of Narcotics and Dangerous Drugs for the registration and control of all persons and firms in the U.S. engaged in the handling of specified drugs. The system is being implemented on the IBM System 360/50 computers. He is also a principal in the design of a computer system to automate the back office data processing operations of a brokerage firm. Mr. Colilla also played a major role in the analysis of the computer system performance of a wholesale grocery operation.

Information and Communications Applications, Inc., 1968 - 1969

As Manager of the Data Management Department, Mr. Colilla designed and supervised implementation of a general purpose data management system for the Small Business Administration. The exclusively tape system capable of handling 400,000 records was written in FORTRAN for the Honeywell 2200 computer. To facilitate its use in economic analyses, the system incorporated capabilities for definition of file structures with variable length records, containing fixed and repeating fields; standard and selective data edits; sequential and selective data updates; and tabular and listed report generation. He also designed and supervised implementation of several small, special purpose data management systems for the National Cancer Institute's Clinical Data Processing System.

Informatics, Inc., 1964 - 1968

As manager of Programming Systems, Mr. Colilla was responsible for the direction of several development projects in the areas of operating system design, data base management, and compiler development. These projects, sponsored by the Department of the Air Force (Rome Air Development Center), included:

- investigation of techniques for automatically partitioning programs into "pages" at compile-time to minimize the number of out-of-core references at executive-time by the resulting programs in a time-shared GE-645 computer.
- evaluation of the effects of the use of an associative memory with a CDC 1604 computer on the computer's Assembler and JOVIAL compiler.
- design and implementation of a multi-computer, time-sharing system involving eight inter-connected computers and a large variety of terminals, including keyboards, printers, and cathode ray tube devices.
- design and implementation of a large, symbolic multi-level storage system comprised of magnetic cards, tapes, drums, and disks controlled by a PDP-8 computer.

- the design and implementation of program interface and user control functions for a RAND tablet graphic input device associated with a CDC 160A computer.

Mr. Colilla was responsible for three surveys conducted for computer manufacturers and Government agencies on time-sharing operating systems, data management systems, and cathode ray tube displays. He also participated in design of an advanced "fail Safe" message-switching system using the SIGMA 7 computer for a Federal agency.

Radio Corporation of America, 1959 - 1964

Mr. Colilla designed major portions of the ACSI-MATIC information storage, retrieval, and collection system for the Department of the Army. His work included design of file and index structures, and development of a problem-oriented input and retrieval language and techniques for obtaining related retrieval terms. Mr. Colilla was directly responsible for program check-out and operations for two years on the Sylvania MOBIDIC D and 9400 computers, with 72 million character file capacity. He also studied the applicability of content addressable memories to information retrieval problems.

Signal School, U. S. Army, 1957 - 1959

While in military service, Mr. Colilla programmed the IBM 650 computer. He was responsible for a project directed at application of statistical methods to predict the success of enrollees of the Fort Monmouth Signal School.

General Electric, 1956 - 1957

Mr. Colilla programmed scientific applications on the IBM 650 and 704 computers. Specifically, relaxation methods were employed for studying airflow around a nose cone on re-entry to the earth's atmosphere.

The Equitable Life Assurance Society of the United States, 1955 - 1956

Mr. Colilla was primarily engaged in programming solutions for file maintenance problems involving calculation of commissions, premiums, paid-up additions, and dividends. Programs were written for the IBM 650 and 705 computers.

PUBLICATIONS

"Time-Sharing and Multi-processing Terminology",
Datamation, March 1966, Vol. 2, No. 3, 49-51

"Information Structures for Processing and Retrieving",
Communications of the ACM, January 1962, Vol 2, No. 3, 49-51

"Information Structures for Processing and Retrieving",
Communications of the ACM, January 1962, Vol 5, No. 1, 11-16

AWARDS AND HONORS

Phi Beta Kappa, 1955

New York University Founders Day Award, 1956

PROFESSIONAL AFFILIATIONS

Association for Computing Machinery

EDWARD W. VER HOEF
Director of Advanced Information Technology

EDUCATION

Master of Science, Mathematics
De Paul University, Chicago, Illinois 1960

Bachelor of Arts, Mathematics and Physics
Central College, Pella, Iowa 1954

PROFESSIONAL EXPERIENCE

Mr. Ver Hoef is a computer software specialist with over 17 years experience. He has considerable background in design and implementation of business and scientific applications and batch and time-sharing operating systems. His primary areas of specialization are information storage and retrieval and underwater acoustics.

Ocean Data Systems, Inc., Rockville, Maryland 1970 - Present

Mr. Ver Hoef is Director of Advanced Information Technology. In this capacity he is primarily responsible for the development of advanced information storage and retrieval techniques and their application to data management problems for the scientific and industrial communities.

He investigated system utilization/performance factors on the Fleet Numerical Weather Central's dual processor CDC 6500 computer system and has developed programs for their measurement. He has worked on the development of system programs designed to bring disk input/output into better balance with the internal processing speeds and main memory cycle sharing for the CDC 6500. Mr. Ver Hoef has also developed programs to measure and compare allocated vs. expended system resources on a per user basis for the CDC 6500. The above programs were implemented in FORTRAN and COMPASS (where appropriate).

In the area of underwater acoustics for the Office of Naval Research, he modified a range prediction system so as to reduce its running time by 85%. This system, implemented on a CDC 6000 series computer predicts detection ranges for various types of sonars under differing conditions. He also designed and implemented the TASSRAP (Towed Array Ship Surveillance Range Prediction) model. This model, implemented on the CDC 6000 series computer, predicts detection ranges for a new type of sonar recently delivered to the Navy. He

participated in the analysis phase of a naval exercise to evaluate the sonar and the various methods for predicting detection ranges for this sonar.

He has designed and implemented for the Bureau of Narcotics and Dangerous Drugs both a Laboratory Analysis Reports Query System and a Defendant Reporting System. The former system provides an ad hoc interrogation capability to drug analysis reports. The latter system provides for an automated data base of drug defendants from which reports can be produced for use in analyzing the prosecution of drug cases. Mr. Ver Hoef is also responsible for the Controlled Substance Act automation project involving the development of a large data base system in which all persons and firms in the U.S. engaged in the handling of specified drugs will be registered. The system will be used to issue certificates to all registrants and control the issuance of forms for ordering drugs. The above systems are implemented on the IBM System 360/25 and 360/50 computers.

Informatics, Inc., 1965 - 1970

As Manager of Programming Systems, Mr. Ver Hoef directed the Programming Research and Development Group for Informatics. He was principal investigator and lead designer for several data management projects including:

- The Block File System for the management and control of all auxiliary storage devices used by a data management system developed for the Department of the Air Force Integrated Information Processing System. This system allowed for the symbolic addressing of all data and permitted the dynamic movement of data among different storage devices without user intervention or concern.
- A storage and retrieval system for the Civil Aeronautics Board for use in maintaining and accessing financial and traffic information submitted by all the certified U.S. air carriers. The data base was comprised of approximately 36 million characters on-line plus a similar amount in a history file. The system was implemented using the Mark IV File Management System, an Informatics proprietary generalized data management system.
- The Physics Literature Retrieval System for the American Institute of Physics. This system enables physicists to prepare near-English queries to search a file consisting of descriptions of physics journal articles and receive desired portions of all records satisfying the query.

- A survey of several file management systems, conducted for a major computer manufacturer. The report compared each of the systems on approximately 90 parameters.

Mr. Ver Hoef also developed and implemented a test bed for the comparison of automatic program segmentation algorithms and designed two such algorithms. This work included the development of a special JOVIAL compiler able to produce re-entrant object code on the GE 645 computer system.

Defense Communications Agency, 1964 - 1965

Mr. Ver Hoef was a systems analyst, responsible for the coordination of the activities of Mitre Corporation on behalf of the Joint Chiefs of Staff. He was specifically involved in the determination of information requirements of the National Military Command System and the ensuing file design process.

Radio Corporation of America, 1960 - 1964

As a programming staff leader in the RCA Data Systems Division, Mr. Ver Hoef was assigned to the ACSI-MATIC project, an information storage, retrieval and collation system for the Department of the Army. The data base for this system was approximately 72 million characters. He designed and supervised the implementation of the information processing subsystem input phase and the entire query and retrieval subsystem. He developed a capability which allowed the specification of an irregular shaped polygon as a search parameter of the query and retrieval subsystem using geographic coordinates as the vertices of the polygon. He also performed feasibility investigations on supplementary system features.

Commonwealth Edison Company, 1957 - 1960

As a member of the staff of the Vice President for Operations and Engineering, Mr. Ver Hoef's responsibilities included engineering programming and operations research tasks. Prediction of hourly loads on specified generation systems was a primary activity. He also evaluated techniques for automatic economic control of remote generators from a central station and researched methods for automatic commitment of generators.

University of Illinois, 1956 - 1957

While a graduate student, Mr. Ver Hoef worked as an assistant to Dr. James Bartlett of the Physics Department in the investigation of the minimum energy levels of the

hydrogen atom and its deuterium isotope. This involved the solution of partial non-linear differential equations. The solution was achieved by programming the University's ILLIAC-I Computer.

White Sands Proving Ground, New Mexico, 1955 - 1956

While in the U.S. Army Signal Corps Mr. Ver Hoef developed the formulae for automatically correcting radar derived missile tracking data for curvature of the earth.

PUBLICATIONS

"Automatic Program Segmentation based on Boolean Connectivity", Proceedings of AFIPS 1971 Spring Joint Computer Conference, AFIPS Press, May 1971, pp. 581-592.

"A Compact Finite State Machine for Program Control", Software Age, October 1968, Vol. 2, No. 8, 8-12

"Design of a Multilevel File Management System", Proceedings of the 21st National Conference of the ACM, Thompson Book Co., Washington, D. C., 1966, 75-86

Commentary on "An Approach to Peak Load Economics", Proceedings of AIEE, 1968 (Co-authored with H. Brown)

PROFESSIONAL AFFILIATIONS

Association for Computing Machinery

CHARLES L. BAKER
Technical Director

EDUCATION

Bachelor of Science, Physics
Massachusetts Institute of Technology

1951

PROFESSIONAL EXPERIENCE

Mr. Baker's 21 years experience as a computer software specialist includes significant contributions to the development of compiler, operating systems and modeling technologies for both engineering and data processing applications. He has been closely associated with the design and implementation of pioneering interactive, man-machine programming systems and languages.

Ocean Data Systems, Inc., Rockville, Maryland, 1972 - Present

Mr. Baker is a member of the senior technical staff. In this capacity, he is primarily responsible for development of programming languages for both "batched" and "interactive" modes of operation. He also contributes to the development of Program Budgeting, Cost Structure and Force Application Models.

Mr. Baker was the principal investigator in the analysis of the processing, storage and retrieval requirements for the I/TOS-D meteorological satellite data and developed the design specifications for a system capable of satisfying these requirements. Mr. Baker was also responsible for the implementation of the SHARPS acoustic range prediction model on the CP-642 computer and the FACT transmission loss model on the CDC 6600 computer.

International Computing Co., Bethesda, Maryland, 1968 - 1972

As Director of Systems Programming Development, Mr. Baker was responsible for the design, development, and implementation of ABLE, ICC's proprietary business teleprocessing service. He specified the data management and information retrieval techniques required to manage a large, multi-level, on-line data base; specified the high-level, machine-independent language features required; supervised the programming and check-out of the system in IBM System/360 machine language. He also reviewed planning, development, and marketing plans for a wide variety of application programs, including Financial Accounting, Order Processing and Inventory Control, Professional Timekeeping and Billing, Cost Account and Control, Payroll, etc. As Director of the ICC Data Center (IBM 360/50), Mr. Baker provided traditional commercial and scientific computational support (service bureau operation) to the business community.

IBM Federal Systems Center, Gaithersburg, Maryland, 1967 - 1968

As Manager, On-Line Time-Shared Systems, Mr. Baker was responsible for the introduction of time-sharing techniques into the Center with the specific goal of increasing programmer productivity. A research task, Investigation into Programming Cost Factors, required the development of principles and techniques necessary to analyze the programming development process along with the derivation of cost estimating relationships and productivity measures. This resulted in the creation of a large, computer-maintained base of information relevant to the programming process, and associated file processing programs. A second task provided estimates of the capabilities of existing and planned (IBM) time-sharing research projects, and the introduction of time-sharing systems into the FSC programming environment. Papers published by department personnel included an in-depth comparison of conversational systems, and a design proposal for a computer utility tailored to the FSC programming environment. He served as member of technical review boards for internal IBM R&D programming projects and lectured at IBM R&D centers on principles of system design. He participated in and contributed to a number of internal IBM symposia on man-machine interaction and time-sharing systems.

RAND Corporation, Santa Monica, California, 1956 - 1967

Mr. Baker served in a number of capacities during his tenure at RAND, performing a wide variety of tasks including:

- Mr. Baker was project leader for JOSS, an on-line computer service designed for scientists and engineers. This project was part of RAND's continuing research into advanced applications of computer technology for scientific problem-solving. He coordinated with RAND researchers in all disciplines to determine the nature and extent of computer problem-solving support required. He had system management responsibility for all phases of the project, including justification and planning of system objectives; preparation of bidders' material, contractor proposal evaluation, and selection; system configuration; software and hardware design; system installation and checkout; user training and documentation. Specific technical activities included design and specification of the JOSS remote typewriter console, interfaced to the computer through a unique private-wire installation which distributes "JOSS computer power" automatically to any of 300 different wall outlets within the RAND complex, and over leased and dial-up networks to remote installations throughout

the country. Additional technical duties included responsibility for all software implementation of the JOSS language, including specification thereof. He supervised personnel orientation, training, and the installation of JOSS consoles at McClellan AFB; at the Air Force Academy; for the Directorate of Studies and Analysis, Air Force Deputy Chief of Staff; the Advanced Research Projects Agency; and the Assistance Secretary of Defense for Systems Analysis. He is the author of three, and editor of more than fifteen Rand Reports describing and documenting the JOSS system. During this period, Mr. Baker was an invited speaker on time-sharing techniques at numerous university, industrial and professional seminars in topics on Computer Science Research.

- During 1963, Mr. Baker was responsible for operational evaluation of the systems' predecessor, implemented on RAND's JOHNNIAC computer. As part of this evaluation, he supervised production of, wrote script for, and appeared as narrator in a 22 minute 16mm. color, sound film JOSS. This film has been circulated widely since 1964 in universities and research organizations both in this country and abroad.
- During 1961-1963, Mr. Baker was Leader, Automatic Data Processing Group (Bethesda, Md.). In 1961 the DOD Comptroller requested RAND to aid in the establishment of a Defense-Department-wide Planning and Program Budgeting System; the Bethesda Office of RAND was established for this purpose. Specific duties in this position were two-fold: one, to advise the DOD of its data processing requirements in establishing the Five Year Force Structure and Financial Plan (Program Budgeting) reporting system; second, to design and implement a Force Structure Planning Model to permit examining the cost and other resource requirement implications of proposed force structure changes in defense posture. He supervised the design, specification and development of the Army Cost Model, which was implemented on the IBM 7090 (in machine language) and transferred, in operational status, to the Department of the Army in 1963. This model uses advanced list processing and interpretive techniques to insure applicability to a wide range of force structure problems. A modification of this model was also developed for the Navy.
- During 1959-1961 Mr. Baker was a Systems Programmer. He programmed the Information Processing Language Five (IPL-V) system for the IBM 704-709-7090-7044 series of machines, specified many features of the final, complete system, and participated in the pre-

paration of the IPL-V users' Manual. This system is still widely used in many research establishments, both in the U.S. and abroad, and the system has been subsequently implemented on a wide variety of computers of many different makes.

-- During 1958-1959 Mr. Baker was the RAND Representative and Liaison to the Control Division, Directorate of Operations, Headquarters, Strategic Air Command, Omaha, Nebraska. He consulted in preparing critiques of proposed system specifications, and in determining operational specifications for both hardware and software of the SAC Control System 465L. He aided SAC Control Division personnel in coordinating activities between SAC, the hardware contractor (IBM) and the software contractor (SDC), and helped transfer SAC war planning and control procedures from manual methods to a newly installed IBM 704. The later included both specification of machine techniques and procedures, and training of Air Force personnel in programming techniques.

-- During 1956-1958 Mr. Baker was a Systems and Application Programmer. He designed and programmed a large-scale force structure cost planning model, PROM, for the IBM 704. This model was the forerunner of many of Program Budgeting and Planning techniques later introduced into DOD and, eventually, into all government departments. He planned and programmed software systems for the IBM 704. As first acting secretary, he organized the SHARE Operating System working group which was to produce the first large scale operating system, SOS, for the IBM 709. He submitted to this committee the initial proposal for the Modify and Load concept which was adopted as the basis for the SHARE Assembler, Compiler and Translator, and is incorporated into all current computer operating systems.

Douglas Aircraft Co., Los Angeles, California, 1951 - 1956

As a Computer Specialist, Mr. Baker performed several functions including:

-- In 1955 he became Douglas' delegate to the Project for the Advancement of Coding Techniques (PACT), a cooperative group of Southern California IBM 701 users, to develop a compiler for that machine. He helped specify this compiler, and programmed the input-output routines for the system. The PACT committee, working at the RAND Corporation, produced the first working compiler, and as a result of this success, became the precursor of SHARE and subsequent user groups.

- In 1954, as programming coordinator, he supervised programmers working on engineering problems in addition to systems and applications programming duties.
- In 1953 he installed the Douglas IBM 701 system, including software; began writing, collecting, and editing material for the Douglas Computing Engineering Manual. He programmed aircraft and missile engineering problems for the IBM 701.
- In 1952 he programmed engineering computations for the CPC, including both aircraft design and missile engineering problems. He designed and programmed the Douglas Assembly System for the IBM 701, and checked out system programs on the prototype machine.
- In 1951 he participated in the solution of engineering problems on IBM E.A.M. equipment. He designed, wired, and tested Douglas' general purpose boards for the Cards Programmed Calculators, Models I and II.

PUBLICATIONS

"JOSS: Console Design", RAND Memorandum RM-5218-PR, February 1967

"JOSS: Introduction to a Helpful Assistant", RAND Memorandum RM-5058-PR, July 1966. Invited Paper, presented at the 11th Annual Data Processing Conference, University of Alabama, Birmingham Center, May 1966

"JOSS: Scenario of a Filmed Report", RAND Memorandum RM-4162-PR, June 1964

"Army Cost Model Programmer's Reference Manual", RAND Memorandum RM-3721-ASDC, July, 1963

"The RAND-SHARE Operating System Manual for the IBM 7090" (co-author), RAND Memorandum RM-3327-PR, September 1962

"Army Cost Model Preliminary Report", RAND Memorandum RM-3250-ASDC, August 1962

"Information Processing Language-V Manual" (co-author), Prentice Hall, Inc., Englewood Cliffs, N.J., 1961

"The First Six Million Prime Numbers" (co-author), July 1957, The Microcard Foundation, Madison, Wisconsin, 1959

"Digital Computer Programming by D.D. McCracken", An invited review; published in Mathematical Tables and other Aids to Computation, Vol. XI, October 1957, No. 60, pages 298-305, (National Academy of Sciences)

"Computing Engineering Handbook" (Editor; with others)
Douglas Aircraft Co., Inc. Report SM-19232, January 1956

"The PACT I Coding System for the IBM Type 701",
Journal Assoc. for Computing Machinery V.3, No. 4, October
1956. Presented at the Annual Meeting of the A.C.M.,
Philadelphia, Pa., September 15, 1955

KENNETH R. OSBORNE, II

Senior Associate

EDUCATION

Master of Science, Mathematics 1966
University of Arkansas

Bachelor of Science, Physics 1965
(with honors)
University of Arkansas

PROFESSIONAL EXPERIENCE

Mr. Osborne is a computer application system designer and programmer with over seven years' experience. He has focused on the development of real-time and signal processing systems. He has utilized both assembly and FORTRAN compiler level languages in IBM 360, CDC 6000 series and TI 980 computer operating environments.

Ocean Data Systems, Inc., Rockville, Maryland, 1972 - Present

Mr. Osborne is a member of the technical staff. He is principally concerned with the design and development of environmental models and signal enhancement processing systems, with particular attention to oceanographic and atmospheric interactions.

Texas Instruments, Inc., 1966 - 1972

Mr. Osborne was a member of the technical staff in the capacity of a computer system applications analyst. In this role, he was assigned lead technical and management responsibilities for a series of projects including his roles as:

Program manager from 1971 through 1972 of the station processor software modifications contract. This work involved significant system and application software upgrade development for a real-time data acquisition and signal enhancement processor system utilizing dual TI 980 mini-computers. In addition to software development, the project involved field operational software implementation and operational site data analysis. All programming was at the assembly language level. Signal enhance-

mant processing utilized time domain Widrow adaptive multi-channel filtering.

Task manager from 1970 through 1971 for Project Caesar field assignment at the Fleet Numerical Weather Central. This work involved the software design, development and implementation of a non-real-time simulator for marine acoustic signal enhancement processing on the CDC 6500 computer system. Signal enhancement processing utilized frequency domain Weiner multi-channel filtering. Software was primarily in FORTRAN Extended, with some COMPASS assembly language optimization. Additional responsibilities included organization and direction of production data processing for the task effort.

Task manager from 1969 through 1970 for the Vela uniform field assignment at the Seismic Array Analysis Center, Washington, D.C. Activities included the software design of an LP array real-time data acquisition system implemented on an IBM S/360 Mod 40 computer in assembly language (ALC) under DOS. Primary responsibilities comprised the design, development and implementation of a non-real-time LP seismic signal enhancement and array evaluation system of programs. Analytical techniques included Wiener multi-channel filtering, coherence and directional spectra. Off-line processing software was primarily written in FORTRAN IV, with assembly language optimization.

Task manager from 1968 through 1969 for Project Caesar field assignment at Fleet Numerical Weather Central. Primary responsibilities included software development and data processing for a feasibility study of marine acoustic signal processing using a CDC 6500 computer.

Applications programmer analyst from 1966 through 1968 for Science Services Division for Geosciences. Experience included earth and marine signal processing, software development and management forecast programming. Work was performed utilizing IBM 360/50 and 360/65 computers under OS.

HOWARD D. STRAUS

Senior Associate

EDUCATION

Bachelor of Science, Physics 1964
Massachusetts Institute of Technology

PROFESSIONAL EXPERIENCE

Mr. Straus' nine years of professional experience include the design and implementation of scientific, commercial and communications programming systems. He also has significant background in the development of computer graphics systems. He has employed the FORTRAN, COBOL, PL/I and BASIC compilers and COMPASS and ALC assemblers on the IBM S/360-370 series computers, under both OS and DOS, and the CDC 6000 and 7000 series computers under SCOPE.

Ocean Data Systems, Inc., Rockville, Maryland, 1971 - present

Mr. Straus is a member of the technical staff. He has been involved in work in a wide variety of fields including graphics, antisubmarine warfare, educational testing, geophysical research, systems programming and meteorological research.

He developed, for Fleet Numerical Weather Central, data compression techniques which take advantage of weather contour shapes to achieve significant data volume reduction. This reduction makes data transmission over low-speed lines quite reasonable. The resulting display on the NEDS terminal offers no loss of detail after the data is reconstituted.

Mr. Straus has provided computer support for major antisubmarine warfare exercises of the Office of Naval Research. Most recently, he was responsible for data analysis and display programs on a CDC-6500 and on a Nova minicomputer before and during an exercise in the Mediterranean Sea.

The mini-computer was equipped with a CRT console capable of graphics so that extensive use of graphic displays for the operator was implemented with full editing capabilities.

He has developed general purpose plot routines for faster printer/plotters built by Varian Associates. These routines have been implemented on CDC-3100, CDC-6600, CDC-7600, IBM S/360 and S/370 computers. In addition, he has developed special purpose programs for such diverse purposes as contour mapping, three-dimensional terrain representation and geophysical exploration.

Mr. Straus also participated in ODSI's optimization effort on the CDC-7600 NOAA primitive equation meteorological prediction model, which resulted in significant time savings in the running time of the prediction.

Mr. Straus developed the capability to generate microform plots at Lawrence Berkeley Laboratories for HN model outputs, and also weather fields over the Mediterranean area. The aim was to get report quality output from the computer and the resulting microform output quality has been excellent.

Dura Consultants, Palo Alto, California, 1969 - 1971

As an independent consultant, Mr. Straus provided developmental programming and support services to a wide range of users. He was a principal investigator for projects which included work for:

Office of Naval Research, involving the research and development of operational acoustic detection and surveillance programs, ambient noise prediction programs, counter-detection programs and advanced general-purpose display systems.

Varian Associates, involving the design, implementation and maintenance of the general-purpose plot routines for the Varian Statos series electrostatic plotter/printer devices and provision of training, education and operating materials. These routines included the capabilities for 3-D, gray scale and shading plots.

CTB/McGraw-Hill, involving the development of Washington and Missouri state school assessment programs correlating demographic variables with student achievement, programs to generate scoring keys from optically scanned test sheets, programs to produce directly publishable tables and reports and programs to manipulate and compile data statistics.

Fleet Numerical Weather Central, Monterey, California,
1967 - 1969

As a commissioned officer, Mr. Straus served as a research programmer/analyst. He was actively engaged in development of state-of-the-art ocean acoustic propagation loss programs for operational support of fleet ASW units and long-range ASW surveillance units. He also participated in design and implementation of high-speed communications programs for the Navy/Air Force Weather Network and was a lead researcher in the development of graphics programming systems. Mr. Straus' other activities included the writing of assemblers and meteorological forecast support programs and providing technical liaison with other fleet and Department of Defense units.

IBM, New York Brokerage Office, New York, N.Y., 1964 -
1967

As an associate systems engineer, Mr. Straus was involved with development of a major low-speed brokerage communications system known as BCCAP (Brokerage Communications Control Applications Program). This system controls the majority of low-speed brokerage communications in the U.S. and is installed in over a dozen major Wall Street brokerage houses. In particular, Mr. Straus installed dynamic core allocation/queuing logic, a two-queue priority scheme, major efficiency modifications in the overlay control monitor, distribution list logic, recovery routines and general and special purpose line control overlays.

AWARDS AND HONORS

IBM Systems Engineering Symposium
IBM Regional Manager's Award
Admiral's Letter of Appreciation (COMASW^{OR}LANT)

WARREN S. YOGI

Computer Specialist

EDUCATION

Bachelor of Science, Geosciences
University of Hawaii

1968

PROFESSIONAL EXPERIENCE

Mr. Yogi has been programming on large scientific computers for eight years. His work includes data reduction and formatting, environmental modeling and simulation. His most recent work has been focused on typhoon forecasting and interactive CRT devices.

Ocean Data Systems, Inc., Rockville, Maryland, 1972 - present

Mr. Yogi has the major responsibility in the development, operation and maintenance of long-range acoustic models for the Office of Naval Research and Fleet Numerical Weather Central. He has also developed several complex post-processing programs to sort the huge volumes of acoustic results from the major models and present detailed summaries in a variety of graphical and tabular forms.

A major task was in support of a shipboard mini-computer with CRT, disk, cassettes and hardcopy, with a primary objective of acoustic prediction. By developing interactive plotting routines to display intermediate and final results, the system capability was greatly expanded. Also, a data-editing program was added to allow the operator to remove or correct errors in the data files.

He is also involved in improving typhoon forecasting for FWC Guam on their CDC 3100. Part of the current effort involves recomputing the correlation coefficients from the modified historical data file.

Mr. Yogi is presently working on a major project involving the development of a basic plotting package of computer-generated displays for a color monitor. Displays of three-dimensioned data and also movie-

sequence type display of a primitive equation forecast have been generated. Current work is being done on a ship routing display, where the forecast surface pressure field and wave heights are superimposed with the actual ship movements.

In addition, he is improving the computer code for two primitive equation models. One is the EPRF Hydrodynamical Numerical (HN) model to be operational on a CDC 3200 and the other is the NOAA atmospheric model modified for the CDC 7600. The objective for both is optimum run time with no loss in accuracy.

Another major task is the development of an interactive graphics driver for the FNWC 6500 with the Tektronix 4012 as the display output. Major features of the system include full line and character mode capabilities, windowing and blanking of selected areas, overlaying of selected areas, and modification of data fields by the operator.

Mr. Yogi has also developed a program to generate geographical backgrounds for any selected area for the NEDS graphics terminal. He has also a program that will scan the 6500 dayfile and display selected parameters on the on-line plotter in a compact but readable form. The result is a running analysis of the performance of the computer system in a vivid graphical form, rather than tables of printed summaries.

Office of Naval Research Liaison Officer for Acoustics,
1970 - 1972

While still in the Navy, Mr. Yogi was reassigned to the ONRL office to work on special acoustic projects, specifically in the field of long-range underwater acoustics. Heavy use of the electrostatic plotters was made during this period, primarily in displaying the loss versus range plots, but also in depicting the environmental parameters such as bottom topography, sound speed profiles and the still popular ray traces.

Some of the large programs were modified for the Lawrence Berkeley Laboratories' 7600 and extensive use of microfiche output as an alternative to printer paper was quite effective.

Fleet Numerical Weather Central, Monterey, California,
1968 - 1970

Mr. Yogi served in the United States Navy at Monterey, devoting his entire tour to improving some of the Navy's latest acoustic detection models. Initially, only Calcomp incremental drum plotters were available, but extensive use of these was made in producing ray tracings, sound loss plots, contour maps and various other visual displays which greatly aided the conception of new ideas in the various models. With the introduction of the Varian electrostatic plotters, Mr. Yogi assumed responsibility for a partially coded software package, optimized the existing code, added the missing sections and implemented the package for general use. These routines are being extensively used in all on-line plotting.

As a special project, Mr. Yogi endeavored to write and test a computer program that simulated the game of LIFE (Scientific American, September 1969) which was displayed on the left screen of the 6500 main console and was interactive with the operator. As this program tied up the main console, further development was not possible.

University of Hawaii, 1964 - 1968

Mr. Yogi's introduction to graphics was designing and implementing a general set of FORTRAN subroutines on the IBM 360/44 for a Benson-Lehner large table electro-plotter, a 50" x 60" flatbed plotter with four programmable pens and an impact alphanumeric printer. These basic subroutines were then used in the applications programs in support of producing a data atlas for the 1963 - 64 International Indian Ocean Expedition. Extensive data point plotting and contouring was done on this system.

Other graphics were done on a small scale, with a Calcomp 565, an eleven-inch incremental drum plotter and with the IBM 2260, an interactive CRT for alphanumeric only.

GILBERT JACOBS

EDUCATION

Completed all requirements except thesis 1971
towards Ph.D. in Mathematics
University of Maryland

Master of Arts, Mathematics
University of Maryland

Bachelor of Arts, Mathematics
Temple University

Ocean Data Systems, Inc., Rockville, Maryland 1973-Present

Mr. Jacobs is involved in performing physical and mathematical studies and investigations. He is currently concerned with the determination of sound speed fields in two-dimensional ocean planes.

National Security Agency (NSA), Fort Meade, Maryland 1967-1973

While at NSA, Mr. Jacobs was involved in four different projects.

From April 1973 through November 1973, Mr. Jacobs was concerned with a large scale information storage and retrieval system. This system was implemented on the Burroughs 6700 in the ALGOL language and used file inversion and hashing techniques to store and retrieve data. Mr. Jacobs was responsible for maintainance and documentation of the system and to make necessary modifications and additions in response to customer requests. His main contribution to this project was the design and implementation of a "local data base" and file structure which allowed the user to retrieve data before it had been edited by the data editors and entered into the formal data base. This made highly critical intelligence information available to the user almost 24 hours sooner than had previously been the case.

From September 1970 through April 1973, Mr. Jacobs worked on the compiler optimization of an NSA developed language similar to FORTRAN but with additional features to simplify character string manipulations. This optimization was to take place within entire flow blocks as well as within individual statements and was implemented using BCPL, an ALGOL-like language developed by M.I.T. Mr. Jacobs was responsible for designing a machine independent register allocation algorithm and then modifying and implementing this algorithm on the Univac 1108 and IBM 370. This algorithm treats registers as both computational and memory areas and attempts to reduce the number of core memory fetches and stores required by the object code. Mr. Jacobs also designed and implemented other optimization

techniques such as common subsegment analysis and source-to-source translation of source code. He also investigated the properties of the IBM 370 Cache memory and as a result of this investigation, he defined data allocation methods and program structures which would best accommodate its characteristics. In addition, he designed and implemented an algorithm that performs semantic analysis of source level constructs in order to make better use of the MVC instruction on the IBM 370 and to effect the linearization of array references.

From January 1969 through August 1970, Mr. Jacobs worked for a signals analysis group. He developed software techniques for performing fast Fourier transforms and digital filtering. This work was done using a special purpose Sylvania computer (ACP) in a real time environment. He also designed and implemented the software interface between the ACP and the SDS 930. Mr. Jacobs performed liaison with outside contractors and monitored contract specifications and he modified and converted contractor programs to run on the Univac 1108.

Finally, from October 1968 through January 1969, Mr. Jacobs worked for a signals conversion group. He designed and implemented a system on the CDC 3300 in FORTRAN and assembly language to track and plot the probable location of a satellite whose size, weight and other variables were not exactly known. He also wrote several utility programs that become part of the operating system on the CDC 3300.

General Electric, Space and Technology Center, King of Prussia, Pennsylvania June 1965-September 1967

During this period, Mr. Jacobs was a programmer for a flight dynamics group. He maintained and documented a large FORTRAN program on the IBM 7090 that calculated and plotted the characteristics of a nose cone as it passed through the earth's atmosphere. He also formulated and solved mathematical problems relating to reentry vehicles.

AWARDS AND HONORS

Steinberg Mathematics Award - Temple University, 1967

Pi Mu Epsilon (Mathematics Honor Society)

WILLIAM D. EARLEY
Member, Technical Staff

EDUCATION

Graduate Studies	1960-1966
Catholic University	
American University	
Bachelor of Science	1960
Bluffton College	

PROFESSIONAL EXPERIENCE

Mr. Earley has had extensive experience in the analysis, design, programming and management of systems in the area of orbit determination, air traffic control, and telephone network routing. Also associated with these systems, Mr. Earley is very familiar with data base formation and maintenance.

Ocean Data Systems, Inc., Rockville, Maryland, 1972-Present

Mr. Earley is a member of the technical staff. In this capacity he participates in the implementation of meteorological and oceanographic scientific models. He is also involved in the development of information storage and retrieval systems for commercial and government application and the design of communications systems.

Consultants and Designers, College Park, Maryland, 1971-1972

As Senior Analyst, Mr. Earley served as task leader in charge of eight persons in the area of systems analysis and design of a large satellite orbit determination system. Specifically, the major tasks he worked on involved: (1) the incorporation of the Minitract Error Model into the system regression analysis; (2) the design of the Applications Technology Satellite (ATS) System. Both these tasks involved simulation studies to check out the final system; and (3) writing technical proposals in the area of orbit determination.

Computer Usage Corp., Bethesda, Maryland, 1970-1971

As Senior Staff Analyst, Mr. Earley supervised a team of 5 analysts and programmers responsible for the design of a system to automate the routing of all telephone circuits billed through GSA. This system (Automatic Telpak Maintenance System (ATMS)), replaced the GSA manual system, and will provide considerable cost saving to the government for all DOD and GSA telephone circuits.

Mr. Earley was also responsible for a major programming and documentation contract at the NASA/Goddard Space Flight Center. The project required system verification and documentation of a library of 33 main programs and 114 subroutines

involving astronomy, celestial mechanics, orbital mechanics and statistics. He was also responsible for format consistency, technical reliability, grammatical precision and final editing of each document. For this task Mr. Earley supervised a team of 15 analysts, programmers and documentation specialists.

Also, Mr. Earley used a proprietary Fourier analysis program to perform an error analysis study for the GSFC ERTS program. This study involved the spectral analysis of the characteristic frequencies of a set of project Apollo spacecraft data.

IBM, Gaithersburg, Maryland, 1969-1970

As a staff programmer for IBM, Mr. Earley participated in the study and analysis of the Air Traffic Control problem for the Federal Aviation Agency/Washington Office. Specific duties involved the task to design and program a system to simulate the real time radar tracking functions in the NAS real time air traffic control system.

Computer Sciences Corp., Silver Spring, Maryland, 1966-1969

As a Senior Member of the Technical Staff, Mr. Earley was involved in math analysis and process programming in the areas of least-squares statistical techniques, orbit determination, celestial mechanics, data evaluation and satellite attitude determination.

The major tasks were as follows: performed modifications and checkout of the OSO-E Satellite attitude determination program, which encompassed the utilization of the GSFC/NTRAN package; responsible for the design, coding and checkout of the OSO-D Satellite correlated data program utilizing the MAP capability of the UNIVAC 1108 to overlay the various program modules.

Army Geodetic Institute - Ft. Belvoir, Virginia, 1965-1966

As a Research Mathematician, Mr. Earley was engaged in an area of math analysis and technical management, which included application of various types of satellite data to the solution of a variety of geodetic parameters, such as the gravitational coefficients of the earth and the position of a satellite-receiving station on the earth's surface. Mr. Earley was responsible for accumulating satellite data tapes, method documentation and solution formulation. He also served as the Government Technical Monitor for the contract to develop the computer program to recover these parameters (GEOPS). Mr. Earley developed a math algorithm for the selection of a set of satellite elements that would best recover a selected set of resonant gravitational harmonic coefficients.

Naval Weapons Laboratory, Dahlgren, Virginia, 1960-1965

As a mathematician, Mr. Earley assisted in the application of the Navy Doppler data to the solution of a variety of geodetic parameters, such as the gravitational coefficients of the earth and the position of satellite data-receiving stations on the earth's surface, and to the solution of the various transit satellite orbital parameters. Mr. Earley's responsibilities were divided into five general categories: (1) implementing and documenting all required changes to existing formulation, (2) implementing and documenting new supervisory-suggested formulations, (3) consulting with programmers in the checkout of programs, implementing these formulations, (4) submitting computer program runs, analyzing and forming conclusions from the output, and (5) documenting the output and conclusions in the form of internal technical memoranda.

PUBLICATIONS

The Application of Naval Georeceiver Data to the Solution for Ship Positions - Naval Weapons Lab Tech. Memo (Classified) 1965.

The Computation of Satellite Radar Cross Section Area Using Reflecter Power Measurements - Naval Weapons Lab. Tech. Memo - 1964.

MARSHALL LASKY
Member, Technical Staff

EDUCATION

Master of Science, Numerical Science 1970
Johns Hopkins University

Bachelor of Arts, Classics and Philosophy 1961
St. Johns College, Annapolis

PROFESSIONAL EXPERIENCE

Mr. Lasky has acquired over 10 years experience in computer applications analysis, systems design and computer programming. His diverse experience has entailed the application of computer technology to business, management, scientific and engineering requirements. This experience includes the development of a conversational time-shared text and file editing system, the development of an on-line interactive management information reporting system, the development of an interactive mathematical model for simulation of propulsion system characteristics, and the numerical analysis and programming of engineering requirements in the fields of chemistry, combustion and fluid dynamics.

Ocean Data Systems, Inc., Rockville, Maryland, 1973 - present

Mr. Lasky is currently participating in the design, development and implementation of a comprehensive management information system for the U. S. Drug Enforcement Administration. The system will be utilized for drug diversion and analysis. It will support both on-line and inter-active data management and reporting requirements while providing for the automated control of registered drug dispensers throughout the United States. The system, programmed in COBOL for IBM 370/155 and IBM 360/40 computers, generates various types of analytic data on drug inventories, along with highly useful information on drug dispensing patterns.

Schindall Associates, New York, New York, 1972 - 1973

As a Senior Computer Systems Consultant, and Applications Software Manager, Mr. Lasky was responsible for the design and development of a management reporting system which made use of a commercially available time-shared computer complex linked to a network of data communication terminals located at client facilities. The system provided on-line interactive capability for the acquisition, processing and reporting of management information concerned with production scheduling and control. In developing the system, Mr. Lasky gave careful consideration to such factors as program quality assurance, file security, data base access, user protocols, and dynamic source data entry and validation.

Applied Physics Laboratory, Johns Hopkins University, 1963 - 1972

Mr. Lasky's progressive experience at the Applied Physics Laboratory of Johns Hopkins entailed extensive numerical analysis and scientific programming work along with design and development of computerized techniques for text processing.

His text processing systems development experience entailed the design and programming of algorithms for on-line conversational file and text editing, and for the generation of reports on time-shared terminals. The CPS-PL/I computer language was employed, with techniques for use of methods for direct access to disk resident files and list processing. This system, conceived and developed as a result of Mr. Lasky's initiative, has now been in use at the Applied Physics Laboratory for several years. It has served as a vital tool for various administrative and research groups in the preparation of administrative and technical reports, technical manuals and research publications.

In the domain of engineering computer applications, Mr. Lasky was responsible for the design and development of computer programs for numerical and statistical analysis requirements along with the development of computerized mathematical models employed for various engineering research projects. Among the various tasks undertaken by Mr. Lasky during this period was one which entailed the development of a mathematical model of gaseous penetrations into supersonic jet streams. Another task entailed the design of an on-line CPS-PL/I program for the numerical solution of differential equations, utilizing the interactive features of CPS to provide dynamic interface with the physical model parameters. He also designed and developed computer programs employed for the theoretical analysis of ramjet engine performance, with consideration for turbulent mixing and the thermodynamic properties of real gases in chemical equilibrium. Methods employed entailed the iterative solution of non-linear algebraic and differential equations and the use of highly modularized sub-routines for linkage of data-driven computational modules. This also entailed the development of techniques for the dynamic modification of FORTRAN-generated object programs on the IBM 7094.

PUBLICATIONS

"A Unified Analysis of Gaseous Jet Penetration:, with F.S. Billig and R.C. Orth, AIAA Journ, V.9, N.6, June 1971.

"CPS Program EDFILE - A Computer Program for Conversational Editing of Text and Data Files from Time-Sharing Terminals, Report 1: User's Guide", JHU/APL Internal Publication, 1972.

"A Unified Approach to the Problem of Jet Penetration into a Supersonic Stream", with F. S. Billig, and R. C. Orth, AIAA 8th Aerospace Sciences Meeting, Jan 1970, N.Y., N.Y.

"Effects of Thermal Compression on the Performance Estimates of Hypersonic Ramjets", with F. S. Billig and R. C. Orth, Journ Spacecraft & Rockets, V.5, N.9, Sept 1968.

"Guide to Interactive Computing with the Conversational Programming Systems," JHU/APL Internal Publication.

"The Ramjet Performance Analysis Program (RJPA) - A General Purpose Computer Program for the Study of Propulsion Processes in Arbitrary Real Gas Mixtures in One-Dimensional, Equilibrium Flow." JHU/APL Internal Publication.

PROFESSIONAL AFFILIATIONS

Association for Computing Machinery (ACM)

- SIGART (Artificial Intelligence)
- SIGBIO (Biomedical Computing)

AIAA

Maryland Academy of Sciences

AWARDS AND HONORS

Senior Mathematics Award, 1961, St. Johns College
Award - Best Original Thesis by Member of Freshman,
Sophomore or Junior Classes, 1960, St. Johns College

FRANK J. RYAN

EDUCATION

Master of Science, Physics 1971
University of Washington

Bachelor of Science, Physics 1969
California Institute of Technology

PROFESSIONAL EXPERIENCE

Boeing Computer Services, Inc., Renton, Washington, 1973

Mr. Ryan was engaged in scientific applications programming and numerical analysis in support of aerodynamics research. He also dealt with efficiency optimization of large multi-program systems for the dynamic aeroelastic analysis of flexible aircraft and the development of a three-dimensional supersonic potential flow code for arbitrary shaped objects. Mr. Ryan designed a matrix package for the efficient storage and retrieval of large data sets and the out-of-core solution of non-deterministic systems of linear equations. He provided numerical quadrature solutions of singular integral equations arising in aerodynamics. This work was performed on a CDC 6600 with KRONOS operating system.

University of Washington, Seattle, Washington, 1970 - 1972

While employed in the Laboratory of Radiation Ecology, Mr. Ryan was a research assistant and a consultant in the areas of nuclear spectroscopy, statistical analysis and the application of activation analysis techniques to radiation ecology. He developed computer codes for the quantitative analysis of complex spectra from multi-channel, Ge(Li) detector systems. Previously, as a member of the theoretical physics group, Mr. Ryan conducted research in nuclear structure physics on potential energy surfaces of deformed nuclei using statistical models. He developed a new cartesian gaussian basis for use in deformed Hartree-Fock calculations and optimized multi-variable non-linear functionals. He also provided a numerical solution of the Schoedinger differential equations.

U.S. Naval Postgraduate School, Monterey, California, 1966 - 1969

Mr. Ryan was employed during the summers as a research

assistant in the experimental nuclear physics laboratory based around a 100 Mev electron linac. The areas of research included nuclear structure studies of light nuclei, radiation straggling and radiation damage to semi-conductors.

Mr. Ryan has had eight years of programming experience on a variety of machines, including IBM 360/75, 7094, 1130, CDC 6400, 6600, 7600, PDP-5, 8, 10, Burroughs B-5500. He is proficient in FORTRAN, COMPASS, ALGOL and CITRAN programming languages.

PUBLICATIONS

Bull. Am. Phys. Soc. 17, p. 36 (co-author).

AWARDS AND HONORS

National Merit Scholar

CAROL ANN HESS

Junior Programmer

EDUCATION

Bachelor of Science, Bacteriology with minors
in Chemistry and Pharmacology

Philadelphia College of Pharmacy and Science 1963

PROFESSIONAL EXPERIENCE

Ocean Data Systems, Inc., Monterey, California; December 1973
- present

Ms. Hess is a junior programmer. Her primary responsibilities have been associated with the design, development, and installation of discrete software tasks, utilizing the Control Data 6500 computer. Predominantly working in FORTRAN, these efforts have involved large file manipulations with an emphasis upon user-oriented format structures.

CTB/McGraw-Hill, Monterey, California; 1970 - 1971

Ms. Hess was employed as a mathematics consultant. Her duty was to key math concept questions from Prescriptive Mathematics Inventory (McGraw-Hill Publication) to concepts contained in math textbooks.

Thermophysical Properties Research Center, Purdue University,
Lafayette, Indiana; 1965 - 1969

Ms. Hess was employed as a technical coder. Her duties included reading, extracting and coding information from scientific papers about the thermophysical properties of substances and chemically classifying these substances. The result of her contributing effort was the computer-based reference work Thermophysical Properties Literature Retrieval Guide (Plenum Press). The introduction to this Retrieval Guide was written by Ms. Hess. She also developed a training program and wrote a manual for technical coders.

During the time she spent at Purdue, Ms. Hess assisted a Ph D candidate in completing his thesis in Neuropharmacology. Duties included extracting data from electroencephalographic records, computing statistics, keypunching data, drafting graphs, and compiling a bibliography.

Smith Kline and French Laboratories, Philadelphia, Pennsylvania;
1964 - 1965

Ms. Hess was employed as a pharmacologist in the Gastro-intestinal Pharmacology Research Department. She developed surgical techniques and performed a wide range of pharmacological studies of drug analogs on animals. Duties included data evaluation and report writing of these studies. Her responsibilities included the supervision of a laboratory technician.

E.R. Squibb & Sons, New Brunswick, New Jersey; 1963 - 1964

Ms. Hess was employed as a pharmacologist in the Neuro-pharmacology Research Group. She did basic research with stereotaxic placement of electrodes or drug cannulae in specific areas of the brains of anesthetized rats. After recovery from surgery, psychopharmacological studies of drug analogs were performed on these rats.

Data from all experiments was evaluated and reported. Responsibility also included the supervision of a laboratory technician.

PROFESSIONAL AFFILIATIONS

Kappa Epsilon

American Society of the Federation of Experimental Biologists

SUSAN M. JOUDREY
Member, Technical Staff

EDUCATION

Bachelor of Science - Mathematics 1972
University of Massachusetts at Amherst

PROFESSIONAL EXPERIENCE

Ms. Joudrey has had experience in the analysis, design, implementation, and application of computer-based information systems.

Ocean Data Systems, Inc., Rockville, Maryland, 1973-Present:

Ms. Joudrey, as a member of the technical staff, was part of a team which installed the Automated Reports and Consumated Orders System on the IBM 370/OS for the Drug Enforcement Agency in Washington, D. C. The system included editing, updating, and reporting functions. Specifically, she had total responsibility for dictionary maintenance. Ms. Joudrey was also responsible in part for the design and implementation of the technical and programming requirements of the Diversion Analysis and Detection System.

The Analytic Sciences Corporation (TASC), 1972-1973:

As Engineering Assistant in the Resource Management group, Ms. Joudrey was responsible for data acquisition from remote field sites, coding and preparation of the data for computer processing, inputting and editing data from remote terminals and through batch processing, organizing technical information for engineering review and reporting. She was involved with customer interfaces at field site locations on the Air Force's A-7D program and with analysis of navigational accuracy achieved by U. S. Navy submarines and aircraft carriers.

ROBERT R. KOZEL

Junior Programmer

EDUCATION

Mathematics and Programming Monterey Peninsula College	1971 - Present
Data Processing Technician "A" School Naval Training Center, San Diego	1969
Computer Operation and Programming Automation Institute, San Diego	1967 - 1968
General Education Palomar Junior College, San Marcos, California	1966-1967

PROFESSIONAL EXPERIENCE

Over the past five years, Mr. Kozel has been involved in the programming and operation of large-scale computer systems. His most recent experience is the development of file handling and accounting programs. His experience includes the formulation and preparation of meteorologic and oceanographic data. Prior to this, he was assigned as a Data Processing Technician to the Oceanographic Department at the Fleet Numerical Weather Central, Monterey, California.

Ocean Data Systems, Inc., Monterey, California; 1972 - Present

Mr. Kozel has provided programming and data entry assistance in the development of the typhoon and tropical storm prediction system for the Environmental Prediction Research Facility, Monterey, California. He was involved in creating historical files of the large-scale wind patterns in the western Pacific Ocean area. He developed programs to modify and implement these files for use in the various programs of the prediction system. This meteorologic assistance included the drawing of statistical plots and diagrams. Recent assignments include assistance in the acoustic modeling projects for the Office of Naval Research. He was responsible for the construction of world-wide bathymetric and sound velocity data for use in these projects.

Fleet Numerical Weather Central, Monterey, California; 1969-1972

After being assigned to the Oceanographic Operations Department, he was involved in producing operational oceanographic products for the fleet on a twenty-four hour basis. This included

the construction of data and the subsequent computer operations. Mr. Kozel was responsible for the computerized maintenance accounting system for the Naval Auxiliary Landing Facility, Monterey, California. While performing day-to-day operations, he assisted in converting the entire system from the CDC 3200 Computer to the C. 7 6500 Computer.

Prior to his assignment at Fleet Numerical Weather Central, Mr. Kozel was a tower operator on board the U.S.S. Ranger (CVA-61) deployed in the South China Sea.



DEPARTMENT OF THE NAVY

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IN REPLY REFER TO:

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MEMORANDUM FOR DISTRIBUTION LIST

Subj: DECLASSIFICATION OF LONG RANGE ACOUSTIC PROPAGATION PROJECT (LRAPP) DOCUMENTS

Ref: (a) SECNAVINST 5510.36

Encl: (1) List of DECLASSIFIED LRAPP Documents

1. In accordance with reference (a), a declassification review has been conducted on a number of classified LRAPP documents.
2. The LRAPP documents listed in enclosure (1) have been downgraded to UNCLASSIFIED and have been approved for public release. These documents should be remarked as follows:

Classification changed to UNCLASSIFIED by authority of the Chief of Naval Operations (N772) letter N772A/6U875630, 20 January 2006.

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Declassified LRAPP Documents

Report Number	Personal Author	Title	Publication Source (Originator)	Pub. Date	Current Availability	Class.
WHOI73-59	Tollios, C. D.	THE ACODAC DATA PROCESSING SYSTEM	Woods Hole Oceanographic Institution	730901	AD0773114; ND	U
Unavailable	Russell, J. J.	DOCUMENTATION FOR COMPUTER PROGRAM SUMMARY: A COMPUTER PROGRAM TO SUMMARIZE SOUND SPEED PROFILE DATA	Naval Undersea Center	731001	AD0918907	U
MC001Vol2	Unavailable	CHURCH ANCHOR DATA ANALYSIS PLAN VOL 2 (U)	Maury Center for Ocean Science	731001	ND	U
73-9M7-VERAY-R2	Jones, C. H.	LRAPP VERTICAL ARRAY - PHASE III	Westinghouse Research Laboratories	731105	ADA001130; ND	U
55	Weinstein, M. S., et al.	SUS QUALITY ASSESSMENT	Underwater Systems, Inc.	731201	AD ND 745-875	U
ARL-TM-73-42	Mitchell, S. K., et al.	QUALITY CONTROL ANALYSIS OF SUS PROCESSING FROM ACODAC DATA	University of Texas, Applied Research Laboratories	731220	AD ND 600 293	U
Unavailable	Daubin, S. C.	CHURCH GABBRO TECHNICAL NOTE: CONTINUOUS CURRENT PROFILES	University of Miami, Rosenstiel School of Marine and Atmospheric Science	740101	AD0775333	U
Unavailable	Bitterman, D. S.	ACODAC AMBIENT NOISE SYSTEM	Woods Hole Oceanographic Institution	740101	ADA009440	U
ONR MC-002 VOL. 2; XONICS 885	Unavailable	LONG RANGE ACOUSTIC PROPAGATION PROJECT (LRAPP). SQUARE DEAL DATA ANALYSIS PLAN (U) VOLUME 2 - ANNEXES	Maury Center for Ocean Science; Xonics, Inc.	740101	ND	U
ARL-TM-74-12	Groman, R. O., et al.	SPECIAL HARDWARE FOR ARL ANALYSIS OF ACODAC DATA	University of Texas, Applied Research Laboratories	740314	ADA000295; ND	U
Unavailable	Unavailable	ASEPS NEAR FIELD TRANSMISSION LOSS MODIFICATION, P-2205	Ocean Data Systems, Inc.	740401	ADA096583	U
Report 001; MSAG-1	Unavailable	MEASUREMENT SYSTEMS ADVISORY GROUP	Office of Naval Research	740401	ADA096586; ND	U
ACR-196	Gregory, J. B.	PROJECT PACIFIC SEA SPIDER, TECHNOLOGY USED IN DEVELOPING A DEEP-OCEAN ULTRASTABLE PLATFORM	Office of Naval Research	740412	AD0529945; ND	U
Unavailable	Gottwald, J. T.	ANNUAL REPORT FOR 1 MAY 1973 - 30 APRIL 1974	Tracor, Inc.	740524	AD0920210	U
Unavailable	Unavailable	ACOUSTIC MODEL SUPPORT ACTIVITIES, P-2220	Ocean Data Systems, Inc.	740530	ADA096584	U
HCI-CMC-18540	Daubin, S. C.	TRANSMISSION LOSS OF LOW FREQUENCY UNDERWATER SOUND IN THE CAYMAN TROUGH (CHURCH GABBRO TECHNICAL NOTE)	University of Miami, Rosenstiel School of Marine and Atmospheric Science	740601	ADC000424; ND	U
HCI-CMC-18343	Daubin, S. C.	AMBIENT NOISE IN THE NORTHWEST CARIBBEAN SEA (CHURCH GABBRO TECHNICAL NOTE) (U)	University of Miami, Rosenstiel School of Marine and Atmospheric Science	740601	ND	U
Unavailable	Barnes, A., et al.	DISCRETE SHIPPING MODEL	Planning Systems, Inc.	740604	ND	U